Spring 5-15-2020

The Effectiveness of Visual Phonics to Promote Phonological Awareness in Preschool Children with and Without Speech Sound Delays

Katelyn Derby
derbyka@mnstate.edu

The Effectiveness of Visual Phonics to Promote Phonological Awareness in Preschool Children with and Without Speech Sound Delays

A Thesis Presented to the Graduate Faculty of

Minnesota State University Moorhead

By

Katelyn Derby

In Partial Fulfillment of the Requirements for the Degree of

Master of Science in Speech-Language Pathology

May 2020

Moorhead, Minnesota

Announcement of Oral Defense

Name of Candidate:	Katelyn Derby, B.A.
Degree Program and Major:	Master of Science Speech-Language Pathology
Project Title:	The Effectiveness of Visual Phonics to Promote Phonological Awareness in Preschool Children with and Without Speech Sound Delays
Date and Time:	April 20th 2020 at 2:00pm
Location:	Zoom conference call
Examining Committee:	Elaine Pyle, Ph.D., MS/CCC-SLP, Chair Kris Vossler, Ph.D., MS/CCC-SLP Rachel Stotts, MS/CCC-SLP Faith Simonson MA/CCC-SLP

Acknowledgements

I would like to give an incredible amount of appreciation to my family who has given me their unconditional support throughout all of my educational endeavors. I especially value all of their love and encouragement in my graduate studies, and especially this thesis. I also want to give a special thanks to my boyfriend Charlie and my dear graduate school friends, who have been the most patient and supportive people cheering me on. I cannot thank my writing supervisor, Dr. Pyle, enough for being not only a fantastic supervisor, but also a phenomenal mentor. I appreciate all of your support, guidance, and that you always found a way for us to have fun in each phase of this thesis.

Thesis Abstract

The purpose of this study was to examine the phonological awareness skill of letter-sound relationships for preschool students using the multi-kinesthetic Visual Phonics intervention, See the Sound/Visual Phonics. The study had a non-concurrent multiple baseline data procedure, where each child was exposed to a general phonics curriculum in comparison to a Visual Phonics intervention. A specific interest was understanding potential benefits (i.e., rate of mastery) for preschool students with typical hearing, and the potential for Visual Phonics to support improved letter-sound accuracy for children at risk for speech sound disorders and delays. The results of the study indicated See the Sound/Visual Phonics may potentially serve as a tool to use with a variety of students to promote improved phonological awareness skills.

Key words: Phonological awareness, speech sound disorders, Speech-Language Pathology, See the Sound/Visual Phonics

Table of Contents

Chapter I

Introduction

Phonological Awareness

As a child enters their academic school years, they will learn an abundance of new skills that will be used the rest of their lives. Some of these abilities are essential throughout their academic, social, and occupational lives. One of these central skills is phonological awareness (PA). PA is a fundamental skill needed for a child to achieve goals academically (Pullen & Justice, 2003). When considering the many components that make up a child's academic repertoire, most educational professionals will agree phonological awareness is a key ingredient (National Institute of Child Health and Human Development [NICHD], 2000). PA is described by the American Speech-Language and Hearing Association (ASHA) as the awareness of sound structures of a language and having the ability to analyze and manipulate the parts of language in a variety of ways (2019a.). It is used to define the manipulation of units using phonemes instead of words. PA is facilitated by a stronger sound and letter connection that is based on sounds and not simply letters (i.e., orthographic representation). When skills such as sound blending and segmentation are established, students can read, spell, and write with greater confidence (Montgomery, 2008). Without a strong phonological awareness education, students can fall behind in literacy and academic skills.

Correlational studies have identified phonological awareness along with letter-sound knowledge as the two best predictors of a child's reading successes (NICHD, 2000). There are, however, gaps and variations in the rate in which children acquire these skills. West, Denton and Reaney conducted a study in 2001 involving 22,000 kindergarteners nation-wide. Data was collected on specific reading knowledge and skills. The results indicated that only 72 percent of

students studied correctly recognized the beginning sounds of words at the end of the academic year. Additionally, only 52 percent succeeded in labeling ending sounds and even fewer, 13 percent, could recognize sight words. This study highlights that for some children, phonological awareness skills are not fully mastered before first grade and there are variabilities in awareness of sounds across different positions of words. West, Denton & Reaney (2001) concluded that those individuals who were in special education or at-risk for special services widened the academic gap between their peers who are typically developing. This is important because the explicit and systematic instruction of beginning phonics skills (i.e., letter-sound relations) is necessary to prevent at-risk students from continuing to fall behind their peers (Pullen & Justice, 2003). This specific instruction is necessary to meet the needs of students as well as academic standards nation-wide.

By the end of kindergarten, all students are expected by educational state standards to acquire the ability to name letters, apply phonological awareness, identify pre-selected sight words, and demonstrate beginning phonics skills (Basbagill, 2010). Basbagill (2010) suggests some students may not meet these standards due to an impairment or delay with their phonological awareness. According to the Common Core State Standards Initiative (2019), the English language arts standard CCSS.ELA-LITERACY.L.K.2.C for kindergarteners is to "write a letter or letters for most consonant and short-vowel sounds (phonemes)" (Common Core Standards Initiative, 2019). Another standard, CCSS.ELA-LITERACY.L.K.2.D requires children to "spell simple words phonetically, drawing on knowledge of sound-letter relationships". These standards are specific in the phonemic skills they target and may cause more difficulties for populations of students who require a more intensive instruction or academic supports.

Speech Sound Disorders

Phonological awareness can be especially difficult for children who have a speech sound disorder (Farquharson, 2019). A speech sound disorder is characterized by having any combination of difficulties with motor production, perception, and/or the phonological representation of speech sounds and segments (ASHA, 2019b). Children who have a least one sound error (or more) demonstrate an array of difficulties in the classroom (Farquharson, 2019). Further, it has been indicated that children who do not receive any kind of intervention can have academic difficulties throughout adulthood; these implications can be seen in a person's social or occupational environments (McLeod, Harrison, McAllister, & McCormack, 2013).

Speech sound disorders (SSD) can lead to adverse impacts on a child's academic well-being; including difficulties in spelling, early literacy skills, working memory, social-emotional well-being, and participation across the lifespan (Farquharson & Boldini, 2018). Another consequence of having a SSD may be classroom teachers holding different academic, social, and behavioral expectations for these students (Farquharson & Boldini, 2018). This creates an educational barrier and can worsen a child's academic and speech sound perception progress. Due to these implications, the preschool years are crucial for identifying and providing intervention for children with a SSD (McLeod et al., 2013).

The psycholinguistic bases of a speech sound disorder are that a child's phonological categories (e.g., phonemes and syllable shapes) may be disoriented (Preston, Hull & Edwards, (2013). Preston, Hull and Edwards (2013) explain a child with a SSD may have a phonological representational system that is limited and have increased articulation errors characterized by distortion errors or a lack of articulatory precision. There may be a spectrum of articulation difficulties, but all of these multiple error types have all been associated with some form of delay

in phonetic development. While there is substantial evidence to support that phonological awareness is imperative to a child's academic skills, Preston et al., (2013) asserts there is little to no found research to offer a supportive curriculum for children with SSD relating to phonemic awareness.

Children with speech sound disorders are the largest population served by a speech-language pathologist (Farquharson & Boldini, 2018). In response to this, speech-language pathologists (SLP) should place importance on furthering research and intervention strategies for PA that could benefit this population of students. The explicit and systematic instruction of PA skills (i.e., letter-sound relations) is necessary to prevent at-risk students from falling behind their peers (Pullen & Justice, 2003). It is essential for teachers, specialized educators, and SLPs to utilize an effective method to instruct phonological awareness skills.

Phonological Awareness Instruction

Fälth, Gustafson and Svensson (2017) state that implementing phonological awareness (PA) training in preschool has been proven for decades to prevent later reading difficulties. Phonological instruction has been presented in an array of unique methodologies. These approaches may be classified as traditional, phonological, oral-motor, multisensory, or an eclectic approach (Gilbert & Swiney, 2007). According to Gilbert & Swiney (2007), a traditional approach to PA directs intervention to focus on muscle memory. It is reinforced by auditory discrimination, visual supports, and is learned "once a sound pattern is repeated and accepted by the client as the appropriate sound, then it is ingrained in the muscle memory as movement for that sound" (p. 12). Secord (2007) stresses the importance of phonetic placement instruction. In this strategy the clinician could use illustrations or diagrams of the oral structures to reinforce motor movements.

Differing from the traditional intervention, the phonological approach is considered to focus on the patterns of sound deviations instead of single sound errors. The clinician attacks the phonological processes that are impaired and based on the multiple sound errors (Gilbert & Swiney, 2007). Sound approximations may begin with a sound that the client demonstrates difficulty with, and the clinician utilizes auditory discrimination to shape the client's perceptions of the sounds (Secord, 2007). In contrast, the oral-motor approach is taught to the client from the angle of tongue muscle. It is further explained as addressing "the identification and remediation of tongue placement, strength, and movement issues directly related to sound production" (Gilbert & Swiney, 2007, p. 13).

A multisensory cueing approach is a cumulative intervention that utilizes auditory discrimination, kinesthetic awareness of phoneme production, and visual recognition. It can incorporate signs and hand signals that represent manner, place, and voicing of phonemes (Gilbert & Swiney, 2007). A moto-kinesthetic method may also allow the clinician to place their hands in a client's oral mechanisms to physically demonstrate the targeted structures (Secord, 2007). Finally, an eclectic approach to phonological awareness training is when traditional, phonological, oral-motor, and other multisensory strategies are combined to create an individualized approach to each client. Each of these phonemic instructional approaches are supported by research and can be implemented with a wide array of learners (Gilbert & Swiney, 2007). While there are several established phonological awareness methodologies, there are intriguing interventions to consider for specialized populations of students.

See the Sound/Visual Phonics

A desired phonological awareness curriculum for students with SSD and PA difficulties should allow adaptations necessary to meet the learner's individual needs (Basbagill, 2010). One

instructional curriculum that has shown to improve phonological awareness is called See the Sound/Visual Phonics (STS/VP). STS/VP is a multi-sensory strategy that represents all of the sounds in the English language with hand-shape cues and corresponding written symbols (Montgomery, 2008). STS/VP is not a communication system but serves as an intervention to make the sounds of the English language more accessible to a variety of learners. There are 26 letters in the English alphabet and characteristically 45 phonemes. In VP, the 46th hand cue represents a silent /e/ (Woolsey, Satterfield, & Roberson, 2006). This curriculum has typically been used with students who are d/Deaf but shows potential for use with an expansive student population (Narr, 2010). STS/VP is a flexible system that aims to make sounds representable via its kinesthetic and multi-sensory approach. It can be integrated into a variety of literacy activities where sound awareness or sound/letter relations are taught.

One unique aspect of this intervention curriculum is the hand cues and cue cards used to represent the different sounds in the English language (See Appendix A). They are tied kinesthetically to the production of what is happening in the mouth. Hand cues provide visual and tactile representations of individual phonemes and phonemic information (Narr, 2010). The hand signs mimic a part of the mouth, tongue or throat movements (Cihon, Gardner, Morrison, & Paul, 2008). Dave Krupke, an experienced SLP who has extensively used Visual Phonics explains an example of the /t/ phoneme by, “flicking the index finger off of the thumb [which] emulates the release of the tongue from the alveolar ridge when producing /t/” (Montgomery, 2008, p. 177). When spelling the word toe, the hand signs for /t/ and /o/ are used. Articulatory production as well as phonetic word structure is simultaneously implemented in the lessons (Narr, 2010).

STS/VP also uses written symbols in the form of simple line drawings of the hand signs. They can be placed under vowels that are complex, digraphs, and irregular spellings to help clarify sounds in print (Cihon et al., 2008). Due to Visual Phonics flexibility, it has the potential to serve as a tool for students with reading, speech, and language difficulties. It also has the potential to serve student populations who utilize a variety of communication methods (Woolsey et al., 2006). STS/VP's flexibility is characterized by the multi-kinesthetic approach that may appeal to an array of learners.

Visual Phonics was created with the intent to facilitate decoding and improve phonological skills and the ability to be implemented in any literacy activity. This intervention curriculum can easily be manipulated to become individualized, implemented with children who are at-risk in literacy skills, and used with children who display communication or speech sound needs (Woolsey et al., 2006). One enticing aspect of the program is its flexibility to work with a variety of students and specific needs; therefore, it may have a role for children with speech sound disorders. Although literature supports Visual Phonics for literacy skills, it is lacking supportive descriptions of its implementation specifically with children with SSDs. There is suggestion from Basbagill (2010) and Narr (2010) that Visual Phonics demonstrates the potential to serve as a tool for this specific population.

Purpose and Overview of the Study

The purpose of this study was to understand the effect of a multi-kinesthetic Visual Phonics intervention on letter-sound awareness for preschool children who were identified as at-risk for a speech sound disorder. There has been substantial evidence for the effectiveness of VP as an intervention tool for students who are d/Deaf (Kart, 2017; Smith & Ye Wang, 2010; Ye Wang et al., 2013) and children who are typically hearing (Cihon, Gardner, Morrison, & Paul

2008; Gardner, Cihon, Morrison, & Paul, 2013; Basbagill, 2010). The study aimed to expand the existing literature's focus on students who are typically hearing and children at-risk for a speech sound disorder using STS/VP to instruct phonological awareness as it pertains specifically to letter-sound relationship mastery and speech sound production. The specific research questions were:

1. Does a multi-kinesthetic Visual Phonics intervention facilitate the phonological awareness skill of letter-sound relations at a different rate, than a general phonics curriculum for preschool children who are identified as at risk for a speech sound delay?
2. Does sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a Visual Phonics intervention?

It was hypothesized that using the unique multi-kinesthetic approach of Visual Phonics would allow students to master sound-letter relationships at a faster rate when compared to a general phonics curriculum. Additionally, it was hypothesized that Visual Phonics would support student's sound production accuracy from baseline data collection. Most importantly, the researchers aimed to discover if STS/VP would have a positive effect on the children's phonological awareness and letter-sound relation skills for participants with and without a speech delay.

Woolsey et al., (2006) explains this curriculum was first implemented in schools with students who were deaf or hard of hearing, but is now used with an expansive student population. In the past 30 years since STS/VP was designed, there is scarcely published information available about the program's successes. Though there is not much cumulative research, the limited research available shows that it is a beneficial intervention/curriculum for the d/Deaf population (Cihon et al., 2008; Gardner et al., 2013; Ye Wang et al., 2013; Smith & Ye Wang,

2010). The research that is available calls for more studies to be completed on the effectiveness of VP (Ye Wang et al., 2013; Smith & Ye Wang, 2010).

While the previously mentioned studies have used STS/VP with typically hearing children, no studies were identified in a preliminary review of the literature trialing the effects of a STS/VP intervention for students with a SSD on letter sound mastery. STS/VP could potentially serve as an untapped resource for specialized service providers such as SLPs and special educators who work with children with SSDs, if adequate research evidence is established. Although visual cues have an evidence base for children with SSD, the effectiveness for the visual cuing integrated in STS/VP has not been explicitly investigated for effect on phonological awareness or speech sound acquisition for children with a speech sound delay (Dale & Hayden, 2013). Phonological awareness was chosen as the targeted set of skills as it provides a foundational knowledge for a child's entire academic life and career. Preschool students were selected as the target population due to it being the ideal population for evaluating early PA skills.

Benefits of Study

The researcher aimed to answer the proposed research questions and find out if Visual Phonics is an effective tool to use with preschool children who are at-risk for a SSD. This study may be beneficial due to it being unique from established research. If the STS/VP curriculum proved to be effective, this could serve as a phonological awareness and pre-literacy tool for both general and specialized education of speech sound disorders.

Delimitations of Study

This study is limited to the experiences of children in one school. Another limitation of the study is the restricted data collection timeline. Given the circumstances of the school

academic calendar and the researchers academic schedule, data was collected at the beginning of the school year in a designated time frame.

Summary of Chapters

The remaining chapters summarize this master's thesis research by providing a review of the relevant research (Chapter II) and describing the research design and methodology (Chapter III). Chapter IV will present the results of the study, followed by Chapter V, a discussion and interpretation of the results.

Chapter II

Literature Review

The literature review section will explore the research and findings regarding phonological awareness, speech sound disorders, and See the Sound/Visual Phonics. This chapter will provide the theoretical and research background for the present study. First, the importance of phonological awareness in relation to reading skills, academic skills, and the stages of acquisition will be discussed as well as various PA instructional strategies. Next, speech sound disorders will be investigated regarding their characteristics and commonalities pertaining to PA and academic abilities, as well as common elicitation strategies. Finally, the program See the Sound/Visual Phonics will be discussed with the most relative research findings and information.

Phonological Awareness

Phonological awareness is an essential skill that is utilized in an abundance of life skills; such as the ability to read this sentence, write a letter, or compose a text message. Johnson and Roseman (2003) explain PA refers to the ability to recognize that "speech is made up of sentences that can be broken down into words, syllables, intrasyllabic units, and phonemes as well as the ability to talk about, reflect upon, and manipulate these components" (p. 5). Johnson and Roseman (2003) further state that a lack of awareness of sounds in words will be followed by the inability to associate sounds with symbols; ultimately impacting the individual's ability to read and spell. Preston, Edwards, and Hull (2013) add that a weak phonological representation has been suggested as a basis for both speech sound disorders as well as difficulties with a variety of PA skills. These researchers have found that PA is a critical skill in various facets of life.

Reading Skills

PA is not a naturally acquired skill, and must be explicitly taught (Goldstein, 2017). PA should be integrated in everyday activities for students, especially those in a preschool classroom (Pullen & Justice, 2003). Pullen and Justice (2003) stress that a lack of PA skills may cause an individual to not acquire accurate and fluent reading and decoding skills. A 2017 study conducted by Goldstein, Schneider, McCarthy and Kelley researched the effect supplementary Tier-2 interventions would have on students who did not respond to core reading curriculum. The students were subdivided and given either a PA supported intervention, or an intervention that focused on vocabulary and comprehension skills. The findings of this study indicate students who were given a PA centered intervention received higher results on standardized assessments, such as the Test of Preschool Early Literacy (TOPEL) and Clinical Evaluation of Language Fundamentals (CELF), which both target language skills. Further, the statistical findings of the study illustrated that the 82 percent of students receiving a Tier-2 intervention demonstrated improvements in their overall reading scores. The authors of this study suggest phonological awareness is a skill that is imperative to a child's foundational reading abilities and should be an essential element of education.

The explicit instruction of PA is vital for preventing reading challenges for young participants at-risk for reading failure (Pullen & Justice, 2003). Goldstein et al., in 2017 explained that if educators desire to improve academic skills of their students, there must be early prevention and intervention that encourages the exposure to phonological awareness activities. Skills such as sound blending and segmentation should initially be established, and be expanded to target syllables, rhyming, and initial consonants (Preston, Edwards, & Hull, 2013).

A 2017 longitudinal study in Sweden conducted by Fälth, Gustafson and Svensson studied the effect phonological curriculum paired with articulation practice had on pre-reading skills in a preschool classroom. The specific phonological program was called Fonomix and is a multi-sensory method for teaching reading that includes visual, tactile, auditory, and kinesthetic modalities to instruct the relationship between phonemes and graphemes. All participants in the study were assessed given a pre-reading skills evaluation. Based on the results of the assessment, the preschoolers were divided into two subcategories; those who were at risk for reading difficulties, and those who were not.

The findings of this study showed both groups in the at-risk group and not-at-risk group obtained higher scores with the Fonomix at the end of the experiment than the comparison group. These results also looked at scores in speech sounds and words that were in the curriculum, as well as novel sounds and words. The authors did this to provide evidence that PA curriculum can have a broader generalization in transferring of skills. Studies such as Fälth, Gustafson and Svensson in 2017 indicated that PA curriculum targeting a preschool audience may be a profound age to instruct the many facets of PA.

Hierarchies of PA

PA is a complex system and is comprised of a multitude of skills that represent a comprehensive phonological collection. Adams (1990) stated PA is impacted by an extensive hierarchy of abilities such as blending and syllable-splitting, nursery rhymes, oddity tasks (e.g., children are presented with three or four words and asked which one is different such as “give, *pat, girl, go”), phonemic segmentation, and phoneme manipulation. The National Reading Panel (NRP) additionally identified the most frequently used PA tasks were (1) phoneme

isolation, (2) phoneme identity, (3) phoneme categorization, (4) phoneme blending, (5) phoneme segmentation, and (6) phoneme deletion (NRP, 2000).

The NRP (2000) conducted a complete meta-analysis to examine available evidence for the best practices to instruct reading, and found that effective reading instruction contains five elements: phonemic awareness, phonics, fluency, vocabulary, and comprehension. In order to have the greatest impact, reading instruction should include these five components. In the initial reading stages, PA and phonics instructions are the most imperative features of reading. They are highly correlated with each other, and the most important precursors of later reading success (Kart, 2017).

Pullen and Justice (2003) explain that while there are many PA skills to instruct and expose children to, it has been found the preschool years are vital to a child's understanding of print awareness. Children learn phonological categories such as phonemes and syllable shapes and more specific details first, and then higher level categories come together and make up the phonological representation of words. Pullen and Justice (2003) stated that the first form of phonological awareness skill to apply and produce is rhyming. This can be seen in tasks such as rhyming books or nursery rhymes in first onset and rime (the first letter of a word, and the letters that complete the word), then the ability to rhyme, and finally understanding rhymes (Kinzer Courter, 2019). Kinzer Courter (2019) stated the next step in PA is segmenting initially only syllables (e.g., /b/) and one syllable words into sounds (e.g., bee), and continuing with syllables and ultimately sentences (e.g., I see the bee). Blending is the next skill and should be targeted with tasks that apply sounds to words (e.g., tree).

The "final" phase of PA is the ability to manipulate sounds and phonemes (e.g., trees, tee). This can be done by first adding a sound to a word, then increasing difficulty by

challenging a student to add a syllable/sound, delete a syllable/sound, and using a known rime to make a new word. Preston, Hull and Edwards (2013) continue that children learn phonological categories such as phonemes and syllable shapes first, and then higher level categories come together to make up the representation of words. One study that aimed to target sound placement in words was West, Denton, and Reaney in 2001.

The study conducted by West, Denton, and Reaney in 2001 studied 22,000 kindergarteners nation-wide in both public and private school settings. The aim of the study was to find what gains are made during the kindergarten year regarding reading and mathematics. Data was collected on specific reading knowledge of all participants (i.e., letter recognition, beginning sounds, ending sounds, sight words, words in context). This study highlighted that for some children, phonological awareness skills were not fully mastered before first grade, and there were variabilities in awareness of sounds across different positions of words. The authors stated:

> We found little evidence of differential gains from fall to spring. Based on those findings, the conclusion might be that from fall to spring of kindergarten, all children are acquiring knowledge and skills at approximately the same rate, and that they are learning the same things. However, this is not completely accurate. We see a very different picture when we look at children's acquisition of specific knowledge and skills (p. 11).

This statement suggested that not all children are acquiring the necessary skills by the end of the school year. This study analyzed the performance of a variety of students who were either typically developing, in a language minority, or receiving special education services. The study concluded with results finding that 94 percent of students can identify letters, 72 percent understand the letter-sound relationship at the beginning of words; while only 52 percent

understand letter-sound relationships at the endings of words, and an even fewer, 13 percent, could recognize sight words.

West, Denton, and Reaney (2001) concluded that those individuals who were in special education or at-risk for special services, increased the academic gap between their peers who are typically developing. In the authors findings, the students receiving special education services scored lower on the assessments than their peers. These results demonstrate there are students whose foundational PA skills are not being mastered in an educational structure where these skills must be understood in order to further their academic progress.

In a 2010 thesis paper, Basbagill reflected on standards in place for kindergarteners in the United States. By the end of the kindergarten year, young students are expected to meet state standards of naming letters, applying phonological awareness knowledge, identifying select sight words, and demonstrating phonics skills. According to the Common Core State Standards Initiative (2019), the English language arts standard CCSS.ELA-LITERACY.L.K.2.C for kindergarteners is to "write a letter or letters for most consonant and short-vowel sounds (phonemes)". Another standard, CCSS.ELA-LITERACY.L.K.2.D requires children to "spell simple words phonetically, drawing on knowledge of sound-letter relationships" (Common Core Standards Initiative, 2019). Basbagill reflects some students may not have the abilities to meet these standards due to a learning disability or phonological impairment that impedes their ability to learn these skills in a generalized format. Common Core Standards are specific in the phonemic skills they target and can potentially be more difficult for populations of students who may benefit from a more intensive instruction or specific learning approach.

Speech Sound Disorders

Children who are identified with a SSD have been studied and found the disorder impacts not only speech sound production and perception, but also their academic, social, and emotional well-being (Farquharson & Boldini, 2018). SSDs are described by having any combination of difficulties with motor production, perception, or the phonological representation of speech sounds and segmentation (ASHA, 2019b). Preston, Hull & Edwards (2013) state that preschool children with a SSD may have significant impairments in their ability to produce speech sounds and age-appropriate speech is not always produced or acquired in a developmentally appropriate timespan. They continued to explain that preschoolers with SSDs are at an increased risk of developing problems with phonological awareness. The preschool years are an important age range, because when children are between four and five, fundamental speech and language skills should be mastered. This does not necessarily include mastery of some late consonants and clusters, but the most basic and early developing sounds (McLeod, Harrison, McAllister & McCormack, 2013).

McLeod et al., (2013) continued to explain that children who exhibit speech sound errors can have any combination of error types, reflecting problems relating to higher level phonological representations. Not only does it impact phonological processes, but has also been shown to cause reduced capacity to interact with others, fully participate in academic tasks, and engage in life activities. Their study in 2013 explored 143 preschool students' speech sound production difficulties. Each participant was identified by their early education teachers and parents, who completed a questionnaire regarding the child's speech production abilities. They compared speech characteristics of children who would benefit from services though did not receive speech therapy and those who had received direct therapy from a SLP. The researchers

found that most preschool children had not had any direct contact with an SLP, though strongly suggested SLP services should be integrated into early education settings. Their conclusion stated that speech therapy services should be earlier introduced in academic settings and integrated with the early education facilities in order to reduce the potential educational and social impacts that are associated with SSDs.

Farquharson and Boldini (2018) found that having a SSD can have a negative impact on social-emotional well-being and participation across the lifespan. These realities are concerning for the targeted population, especially since children as young as four years old are aware of the impact their SSD has on their daily life participation (Farquharson, 2019).

Farquharson and Boldini (2018) surveyed speech-language pathologists that were working in the school setting and reported that 90% have worked with students who have a SSD. For those students who do not receive speech-language therapy intervention services, they have been reported to have continued difficulties throughout their educational life (Mcleod et al., 2013). These difficulties can be skills such as spelling, reading, writing, and any combination of these skills applied in a complex task (Farquharson, 2019).

Speech Sound Disorders and Phonological Awareness

Several studies have reported that children with SSDs who have typical language skills are still at an elevated risk for PA difficulties (Farquharson, 2019; Gernand & Moran, 2017; Preston & Edwards, 2010; Preston, Hull, & Edwards, 2013). Preston, Hull & Edwards conducted a study in 2013 to determine if speech error patterns in 25 preschoolers with SSDs predicted future articulation and PA skills four years later. The subjects of the study were initially assessed when they were on average 4:6-years-old and then again tested when they were on average 8:3-years-old. The researchers found that the subjects scored in the below-average

range for their appropriate school-age articulation and low-average for PA skills. The authors concluded that preschool speech patterns may predict different school-age clinical outcomes. They found atypical speech sound errors in preschoolers may be indicative of weak phonological representations, leading to long-term PA difficulties. The researchers additionally found that:

> …recent functional magnetic resonance imaging results have demonstrated that school-age children with residual speech sound errors showed an array of cortical and subcortical differences in how they process phonological information in both spoken and written language (Preston et al., 2012). Thus, problems in producing speech sounds may be associated with weaknesses in processing phonological information in both auditory and written modalities (p. 174).

Gernand and Moran (2007) conducted research with two groups of six-year-old children using standardized and non-standardized assessments of PA skills. The study's purpose was to compare the PA abilities of children who present with mild-moderate articulation disorders and no comorbid language disorder; and those other peers who present with typical speech and language skills. Standardized PA assessments were implemented to find the difference in PA abilities of children who passed a language screening and had no phonological errors, and children who passed a language screening but were found to have phonological errors. Group 1 passed a language screening but demonstrated mild-moderate phonological impairments. Group 2 passed a language screening and exhibited no phonological errors. Results of the study illustrated that the children with phonological errors performed significantly worse on both the standardized and the non-standardized tests of PA. This highlights that children with even a mild phonological problem and no language concerns should be considered at-risk for a variety of PA

problems. PA is a metalinguistic skill that is a clear predictor of future academic success, including reading, decoding, and spelling skills of an individual.

Farquharson (2019) reported that most research on SSD and PA relations show persistent difficulty with speech sound production, regardless of age or number of sound errors and is due to weak phonological processing abilities. Farquharson adds that children with SSDs frequently struggle with spelling because it requires the translation between phonology and orthography. Orthography explains the process of mapping speech sounds to letters—a skill children must master to be able to decode and spell. This requires a strong phonological and orthographic representational system (Farquharson, 2019). Individuals with SSDs can present with an array of speech sound production and PA difficulties, and there have been many different approaches to facilitate these essential skills.

Speech Sound Elicitation Strategies

There are many well-known and utilized speech sound elicitation strategies. Secord (2007) states that *imitation*, or sometimes referred to as auditory discrimination, should be an initial strategy when instructing novel or difficult speech sounds. Secord states, "even when the client is not stimulable in the initial assessment, the clinician may be able to use imitation as a first step in training" (p. 3). Another well-known strategy is *phonetic placement*, which is one of the oldest approaches to sound elicitation. This approach encourages the appropriate placement of articulation, airstream, and voicing. The clinician may utilize various verbal/visual/tactile cues such as verbal descriptions, illustrations/diagrams of anatomy placement, or items such as cotton swabs or tongue depressors.

The *moto-kinesthetic* method has many similarities to the phonetic placement approach. The clinician wears gloves and places their hands in the client's articulatory mechanism and

directs the movements necessary for speech sound production. Visual and auditory stimulation is used as well to give the client an overall sensory experience of correct production. *Sound approximation* refers to when the clinician will "stimulate the client to produce sounds that gradually approximate the target response, until the actual target sound is produced" (Secord, 2007, p. 5). For example, the client may be unable to produce a "-er". This method may encourage the clinician to attempt the client to produce a growling noise, as it is produced in the same area (Secord, 2007).

Along with traditional speech sound production strategies, there are also alternative methods. One of these approaches is using hand cues. The importance of hand movements in learning is an emerging field with promising findings (Cihon, Gardner, Morrison, & Paul, 2008). Rusiewicz and Rivera (2017) researched the implementation of hand gestures with an adult woman with persisting childhood apraxia of speech. Hand cues are often used in therapy as visual and memory cues, though Rusiewicz & Rivera used the hand cues to focus on gestural cues that mimic the spatial parameters of analogous movements of the articulators specifically for the /r/ sound. Their study found noticeable improvement was observed by the clinician after each session was finished. This study illustrates one testimony of implementing hand cues with individuals who struggle with accurate speech sound production.

Research findings support the idea that effective explicit multisensory instruction can improve students' achievement in reading skills (Gardner, Cihon, Morrison, & Paul, 2013). Schlesinger and Gray (2017) investigated multisensory structured language instruction with second grade children who were typically developing as well as some with dyslexia. The students who had received explicit multisensory instruction in comparison to a general instruction had fewer errors in consonant sound discrimination tasks and spelling generalization

tasks. The children with multisensory spelling instruction made significantly greater gains in decoding nonsense words than their peers receiving the typical language instruction (Schlesinger & Gray, 2017). The authors of this study concluded that a multi-sensory instruction may be beneficial for an array of students and types of learners.

See the Sound/Visual Phonics

Instruction that engages sensory modalities simultaneously with the linguistic system has been shown to improve overall learning (Sclesinger & Gray, 2017). The program See the Sound/Visual Phonics (STS/VP) is fitting of this description. STS/VP is a multi-sensory strategy that represents all of the sounds in the English language with hand-shape cues and corresponding written symbols (Montgomery, 2008). In VP there are a total of 46 hand cues, including the silent /e/ (Woolsey, Satterfield, & Roberson, 2006). There is a hand sign given for each phoneme in the English language, which is implemented in a way that imitates a particular aspect of the mouth, tongue, and/or throat movements (Gardner, Cihon, Morrison, & Paul, 2013). These hand cues provide a visual and tactile representation of individual phonemes and corresponding phonemic information (Narr & Cawthon, 2011).

Woolsey, Satterfield and Roberson (2006) explained the difference between the hand cues, stating "each cue is unique and looks different from a finger-spelled letter or any sign. For example, the sound of /c/ could be a hard /c/ as in *cookie*, /k/ as in *king*, or a soft /c/ as in *cereal*" (p. 453). This example shows the complexities one initial letter could have on a child who is initially beginning to learn letter/sound relationships. STS/VP's hand cues and written symbols assist in differentiating the letter-sound associations in words. Written symbols can be drawn under complex words, digraphs, and irregular spellings to assist in clarifying sounds in words on the page (Gardner, Cihon, Morrison, & Paul, 2013) (See Appendix A).

Visual Phonics is not a communication system; it serves as a tool that makes the English language more accessible for an array of learners with different learning styles (Woolsey, Satterfield, & Roberson, 2006). Teachers and educational staff can become certified in STS/VP through professional development provided by licensed trainers through International Communications Learning Institute (ICLI) (Narr & Cawthon, 2011). The parent of a child who is deaf initially created the framework of what is now known as STS/VP in the late 1970s (Montgomery, 2008). This mother originally created hand cues that were linked to the production of sounds for her son and his classmates in a classroom for deaf/hearing impaired children.

This concept was then embraced by Millie Snow, who founded the current Visual Phonics system and International Communication Learning Institute (ICLI) in 1982 (Montgomery, 2008). Visual Phonics was founded with the intent to facilitate decoding and improve overall phonological skills. It was created with the purpose for it to be manipulated to become individualized for any student (Basbagill, 2010). The STS/VP program was first implemented in schools with students who were deaf or hard of hearing, but is now seeing a growth in diversity of students and educators utilizing the system.

While it might seem daunting to learn 46 hand cues and written symbols, this study's investigators became certified in STS/VP before collecting data for the proposed study. The two-day seminar was rich in teaching ways to implement STS/VP with a variety of students, activities, and educational targets (e.g., phonological awareness, speech sound production, reading). The hand cues were reasonably easy to master, given the hand shape correlates with the letter/sound production and natural movement of the mouth/lips/tongue.

A survey conducted by Narr and Cawthon in 2011 researched how a sample of teachers implemented Visual Phonics in their everyday reading instruction and perceived benefits with diverse students. The study's results indicated that out of 200 responses, a majority of the educational professionals utilizing the system were teachers of the deaf (57%), followed by special educators (22%), then regular education teachers (16%), reading specialists (6%), speech-language pathologists (12%), and 10% of respondents chose "other" which may be a parent, program specialist, or volunteer. The survey's population reported STS/VP was used primarily with students who were deaf or hard of hearing and students that had other disabilities not including hearing. The majority of teachers utilized it with elementary aged students.

When asked about the effectiveness of Visual Phonics, participants indicated the greatest improvements were seen in the area of decoding. Other improvements recorded included word recognition, reading comprehension, and student engagement. In regards to the teachers' perceptions of the program, qualitative and quantitative data was collected and 84 percent of respondents agreed strongly or somewhat that STS/VP was easy to integrate into a structured curriculum. Additionally, 68 percent of educational professionals responded that it was effective for all students. Narr and Cawthon's (2011) findings show that 95 percent of participants strongly or somewhat agree STS/VP improves PA. However, these numbers should be cautiously interpreted, as this was a subjective research study and did not provide standardized assessment results.

When prompted about the challenging aspects of Visual Phonics, various qualitative responses included students relying too heavily on STS/VP when decoding, teachers were unsure about the correct sound/letter pair to instruct, and the pace of a mainstream classroom was too quick at times to keep up. The results of this survey illustrated the impact STS/VP is having on

educators and students in a variety of classroom settings. Narr and Cawthon (2011) drew the conclusion that STS/VP is typically used with students who are d/Deaf but shows the potential to be implemented with an expansive population.

Similar Programs

While STS/VP is unique in many aspects, there are several interventions and techniques that resemble the multi-kinesthetic approach. One of these programs is called PROMPT©. PROMPT© stands for Prompts for Restructuring Oral Muscular Phonetic Targets. The technique is a tactile-kinesthetic approach that uses touch cues that are applied directly to the individual's articulators (e.g., jaw, lips, tongue) (PROMPT©, n.d.). Cued Speech™ (National Cued Speech Association, n.d.) is a form of communication that uses handshapes and placements to coordinate with the movements of the mouth to make the sounds of spoken language look different from one another. Cued Speech™ is primarily used to facilitate reading skills and provides a visual and kinesthetic input in phonemic understanding and perception (National Cued Speech Association, n.d.). Both PROMPT© and Cued Speech™ do not have a written component to their systems.

One method that is very comparable to See the Sound/Visual Phonics, is called See It/Say It Visual Phonics. This is a visual phonics program that has the same core components of STS/VP, but differs in types of hand cues, picture symbols, and there are no written symbols. See It/Say It Visual Phonics uses moto-kinesthetic hand cues that correlate with an action, instead of the place of articulation (e.g., /b/ for 'ball' is moving your hand to bounce a ball) (Kinzer Courter, 2019). In Sweden, there is another comparable program called Fonomix, which is a multi-sensory method for teaching reading that includes the visual, tactile, auditory, and kinesthetic modalities to instruct the relationship between phonemes and graphemes. This

systematic program specifically designed a schedule of letter/sound pairs to teach in a designated manner (Fälth, Gustafson, & Svensson, 2017).

Related Studies

A case study conducted in 2010 by Smith and Wang researched the effectiveness of STS/VP as a supplemental reading instructional tool for a preschool student who was deaf. The participant was a 4-year-old child who additionally had a cochlear implant. The researchers used STS/VP in conjunction with a modified version of a pre-selected phonics curriculum. The goal of the study was to determine if the student's phonological awareness as well as speech sound production made progress over the period of the study. Visual Phonics cues were used simultaneously with speech to visually represent initial consonants as well as medial vowels and final sounds. The specific phonics curriculum used was the Fountas and Pinnell Kindergarten Phonics Curriculum, which was adapted for the study and is a bundle of lessons that engage students in learning about letters, letter/sounds, and words.

Pre and post-tests assessed the student's ability to hear and produce vowel sounds from components of the Ling Six-Sound Test. Additionally, the student was assessed on their ability to identify select beginning consonant sounds given Visual Phonics cues, identify the first letter in eleven different words, and identify sounds in words. The findings of the study illustrate the impact STS/VP can have on a child who struggles with PA. In the pre-test, the student was able to produce 27 percent of target sounds; in comparison to post-test results where they produced 91 percent of sounds. Additionally, the student demonstrated progress in identifying target first letters with 100 percent accuracy in the post-test in comparison to the initial 82 percent. On identifying sounds in words, the student scored 28 percent on the pre-test and increased to 83 percent on the post-test. Finally, on matching consonant letters and sounds, the student was

found to have 27 percent accuracy in the pre-test and progressed to 100 percent after the STS/VP program.

Smith and Wang's (2010) data concluded that VP used with a phonics-based curriculum significantly increased both speech sound production as well as PA skills. Observations were taken from both the general education teacher and the student's SLP, on which the teacher stated:

> K seemed to transfer what he learned in the intervention to whole class phonics instruction. Before the intervention, it was typically a struggle to get him to match a letter with its sound, but he seemed more confident in matching the sound with the letter during classroom instruction after the intervention. (p. 129)

The statistical and subjective results from Smith and Wang's study provides support for the benefits STS/VP can have on students struggling with speech sound production as well as phonological awareness. Smith and Wang call for more research on the effectiveness of Visual Phonics and further research into strategies to help students acquire PA skills. Although this study's research design has limitations (i.e., one participant), it does illustrate the impact STS/VP can have on an individual's academic growth and possibility to use with an expansive population.

Following the previous investigation, a 2013 study conducted by Wang, Spychala, Harris and Oetting explored the effects Visual Phonics would have on early reading skills of three preschool students who were d/Deaf with various degrees of hearing loss. The forty-week intervention was conducted through individual as well as group phonics-based instruction, which was supplemented with Visual Phonics. The phonics program focused on phonological skills such as sound production, sequencing, blending, rhyming, and symbol identification.

STS/VP was used as a supplement when targeting skills of sound production in both individual and group settings. The authors found that repetition and mastery of the "Visual Phonics cues, improved letter-sound correspondence skills leading to blending and segmenting, and producing fast rather than slow version of words" (p. 111). Standardized assessments were administered before, during, and after the intervention. Results on the Test of Preschool Early Literacy (TOPEL), Phonological Awareness Literacy Screening (PALS), and the Woodcock-Johnson III (WJ-III) indicated that all participants saw improvements in multiple areas such as print awareness, vocabulary, and rhyme awareness. Furthermore, the participants were later measured in early elementary and found to use at least some of the PA and phonics skills that were explicitly instructed and skills were sustained. Additionally, all students demonstrated an overall reading level at or above their age level when measured in elementary school.

While most published research implementing STS/VP involves students who have hearing impairments, there are two insightful studies that have targeted a population of students who have typical hearing abilities. Cihon, Gardner, Morrison and Paul in 2008 conducted a study with typically hearing kindergarteners who were at risk for literacy failure. The classroom teacher selected participants who would benefit from reading intervention, of which twelve students were selected as participants. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) was used as the assessment tool to measure benchmark skills. The DIBELS determines if a student is performing at the appropriate level for his/her grade level and age in pre-reading and reading skills such as initial sound fluency, letter naming fluency, phoneme segmentation fluency, nonsense word fluency, and word use fluency. The five lowest scoring participants were selected to receive the STS/VP intervention.

The study specifically aimed to find if kindergarten children who are at-risk for reading failure demonstrated gains on the DIBELS after receiving STS/VP instruction in phonemic awareness and initial phonics. Letter sound relations were additionally selected as a target skill and were given instruction through song, flash cards, and words that started with the various target sounds. The researchers conducted the intervention at least three times a week for approximately ten to twelve minutes in a small group of students.

At the end of the study, each participant demonstrated the ability to identify sounds in three sentences containing mostly sounds they have been taught with STS/VP. In addition, participants were able to identify three sentences containing mostly sounds they had been taught in the general classroom but not with STS/VP. Gains were observed for all five participants exposed to STS/VP, and in general the participants who received the STS/VP, reading risk level was decreased. The authors of the study stress the importance of early intervention when targeting students who are at risk for reading failure. Preliminary findings of the study suggested the STS/VP intervention may be appropriate for children who are falling behind with the general phonics curriculum.

In 2013, Gardner, Cihon, Morrison and Paul conducted another study with typically hearing kindergarteners who were at-risk for reading failure. They continued to investigate letter-sound identification abilities as well as study the rate of acquisition of written code, focusing the study as a Tier 2 intervention to kindergarten children identified as at-risk for reading failure. This study targeted several questions such as the effects of STS/VP on letter-sound identification, rate of acquisition when given written code, and maintenance of STS/VP after one month. The DIBELS was additionally used in the research for pre/post measurements.

The complete intervention lasted five months with a maintenance measurement tool given one week and one month after the instruction was finished. The kindergarten class of participants included thirteen students, with six students' data presented due to receiving more than one Tier 2 interventions to learn letter-sound relations. The general education teacher taught the school's recommended phonics curriculum, while the researchers implemented the STS/VP intervention in various groups. Participants of the study entered and exited intervention groups when the letter-sound relation was not mastered (set at 80%) in the general curriculum. The researchers reported that a consistent group of five students required the Tier 2 intervention throughout the study.

Gardner, Cihon, Morrison and Paul (2013) interpreted their findings that STS/VP can be an effective tool for teaching kindergarten students' initial phonic skills. The hand signs and written symbols proved to be an efficacious method for teaching letter-sound relations that were unlearned in the classroom instruction, and skills were maintained upon follow up evaluations. The authors stated, "This Tier 2 intervention was critical in assuring that participants mastered these initial phonic skills rather than continuing in the general curriculum where new letter sound relations were regularly being introduced" (p. 34). This research builds on the previous study conducted by Cihon and fellow colleagues in 2008, where it was found that students who are at-risk for reading challenges could become more successful when given STS/VP instruction. The researchers described Visual Phonics as a promising strategy that has the ability to meet the academic needs of children across a diverse group of learners.

In summary, the research discussed in this literature review established a relationship between phonological awareness skills and individuals identified with a speech sound disorder. The literature highlighted that children with a mild to severe phonological impairment with no

language concerns can and should be considered at-risk for a variety of PA problems (Farquharson, 2019; Gernand & Moran, 2017; Preston & Edwards, 2010; Preston, Hull, & Edwards, 2013). Further, the literature discussed the imperative relationship between phonological deficiencies impacting phonological awareness skills; and how this can impact an individual's academic, social, and emotional well-being (Farquharson & Boldini, 2018). The research focused on the various components involved in a child's success involving speech sound disorders and phonological awareness, and provides rationale for why this research was an appropriate study to add to current and previous literature conducted.

Chapter III

Methodology

The purpose of this study was to understand the effect STS/VP had on letter-sound awareness for preschool children who were identified as at-risk for a speech sound disorder. The research was conducted as a quantitative single subject experimental design (SSED). A non-concurrent, multiple baseline design across sounds was used to evaluate the effects of the STS/VP intervention in supplement with a general phonics instruction. The study's independent variable is the phonics intervention (i.e., general versus Visual Phonics) and the dependent variables are sound letter mastery (i.e., sound letter recognition) and sound production. The specific research questions were:

1. Does a multi-kinesthetic Visual Phonics intervention facilitate the phonological awareness skill of letter-sound relations at a different rate, than a general phonics curriculum for preschool children who are identified as at risk for a speech sound delay?
2. Does sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a Visual Phonics intervention?

Study Setting

The research took place in September 2019-November 2019 at a private elementary school. The research was conducted in a general education preschool classroom. A general phonics education was already established by the school's curriculum as well as implementation of the STS/VP curriculum. The classroom used in the study was one of the only classrooms in the school to not yet implement STS/VP. A general phonics curriculum was utilized school-wide and consisted of phonics instruction conducted in a large-group setting.

Participants

The participants in this study were ten preschool students who were in the beginning of their academic year. Convenience sampling was used to identify preschool students. Convenience sampling uses individuals who are easy to access and fit the characteristics the researcher is looking for (Lavrakas, 2008). Participants were found through a local elementary school upon referral from a local SLP. The students in the study did not have any other disabilities and did not receive supports in the classroom. Inclusion criteria included passing a hearing screener and results from the speech sound screener as either typically developing or a score that indicates the child is at-risk for a speech sound disorder or delay. Participants who failed a hearing screener would have been excluded from the study.

All participants returned a parent permission form allowing them to participate in the study whether they were identified as at-risk or typically developing. The consent form described the study's purpose and addressed the need for parent's permission for their child to participate (See Appendix B). Parents and students were informed their participation is voluntary and they could withdraw from the study without penalty.

Instruments

Materials included in the study were a participant consent form, See the Sound/Visual Phonics instruction cards, a list of letter-sound targets students had errors on, an observer recording data sheet, the Goldman Fristoe Test of Articulation-3 (GFTA-3), and the phonological awareness assessment tool that was implemented within the school system as a pre/post measurement.

Study Procedures

Before beginning the study, the researcher obtained approval from Minnesota State University Moorhead's Instructional Review Board (IRB). The research was then conducted through a quantitative single subject experimental design (SSED). A single subject case design was selected due to the research question pertaining to a select population of students, and the study design's emphasis in using repeated measurements to understand an individual's variability. This variability is used to understand the effects of the intervention (Wambaugh & Schlosser, 2014). The benefits of a SSED include allowing researchers to ask questions that might not be feasible to answer with a traditional group design (Byiers, Reichle, & Symons, 2012). This design can be helpful in an initial study due to it being implemented in a natural setting and the potential difficulty of finding participants that meet study requirements.

The school's internally developed phonological assessment served as a baseline measurement tool for both typically developing students and those identified as at-risk for a speech sound delay. This PA assessment probed students to identify letter names and the corresponding letter sound (e.g., child names letter /t/ when given a picture digraph of "T", /t/ says "tih") of all of the 26 letters of the alphabet. All students in the preschool classroom were selected to participate in the study. Six phonemes were then selected for each week after the baseline assessment was given. The specific phonemes targeted in the study were based off of a combination of the errors found in the phonological screener, speech sound errors from the GFTA-3, and age-appropriate acquisition of sound mastery. The selected phonemes were mirrored in the STS/VP intervention phase of the research as well as the general phonics instruction.

The researcher created two groups in the study, Group A and Group B. The groups were split to be equal in participants. The study then selected the students who scored as "at-risk" on the GFTA-3 and attempted to equally distribute them between the two groups. Participants were considered "at-risk" if they scored ≥2 standard deviations (SD) below the normed results of the GFTA-3. Both groups had students who were typically developing, as well as students who were found to be at-risk for a speech sound delay. The students who were identified as at-risk were grouped together by similar sound errors.

The researcher then used a pull-out method to instruct the multi-kinesthetic curriculum. Students were prompted to make the letter sound after it was modeled, as well as completing additional activities to promote sound blending and identifying the targeted phoneme. For the intervention, the researcher and the classroom teacher conducted lessons twice a week for 20-minute sessions. A generic lesson plan was developed for delivering instruction and a generic dialogue using the /l/ phoneme is presented in Appendix C adapted from Cihon, et al., (2008). (See Appendix C).

The general phonics instruction took place during the entire six weeks of the study (See Figure 1). Regular classroom education consisted of teaching one letter-sound pair weekly. The first two weeks of the study, the classroom teacher instructed the entire classroom using the general phonics curriculum already in place. Weeks 3-4, Group B continued to receive only the general phonics instruction. Group A received the general phonics *and* STS/VP intervention instructed by the researcher. Weeks 5-6, the researcher provided STS/VP intervention to both groups in a small group setting in addition to the general phonics instruction. The researcher started with the most common sounds inaccurately identified from the baseline assessment, as well as convenience of what the general education teacher typically instructs with her schedule.

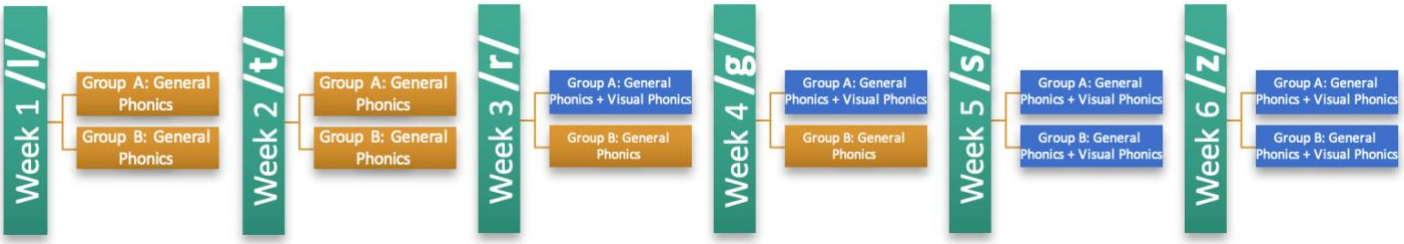


Figure 1. *Overview of Implementation Timeline*

Data Collection Procedures

Once IRB approval was obtained, a parent permission slip was sent out to potential participants of the study and permission from the elementary school to conduct the study. The researcher recorded participant baseline data from the GFTA-3 for speech sound development, and the schools' phonological assessment to gain information regarding PA skills. The data was graphed visually. At the end of the study, the researcher re-administered the phonological awareness screener and speech sound (i.e. letter-sound mastery) probes of the six targeted letters. Participants were administered six probes of each letter, with three in the initial placement of words and three in the final placement.

Data was analyzed to determine if participants who were typically developing and students who were at-risk for a speech sound delay, when instructed STS/VP, were able to identify more letter-sound relations at a different rate when compared to a regular classroom phonics curriculum. Informal data was collected each session during the intervention for participants' accuracy for (1) making the corresponding hand sign independently, (2) receptively identifying the letter that corresponds with the speech sound, and 3) naming the letter. Criteria for mastery was set at 80% accuracy. The study compared the number of weeks taken by each participant to achieve mastery in order to assess rate.

Data Analysis

Descriptive statistics were used to present the results of the study. Data visually displayed if students scored better in comparison to the baseline assessment. The researcher compared the number of weeks taken by each participant to achieve mastery in order to assess rate. Visual inspection of the results was used to analyze if an effect was present in the following results section, chapter four.

Chapter IV

Results

The purpose of this study was to understand the effect STS/VP had on letter-sound awareness for preschool children who were identified as at-risk for a speech sound disorder. This chapter focuses on analyzing the results of the quantitative data to address the following research questions: 1) does a multi-kinesthetic Visual Phonics intervention facilitate the phonological awareness skill of letter-sound relations at a different rate, than a general phonics curriculum for preschool children who are identified as at risk for a speech sound delay?, 2) does sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a Visual Phonics intervention?

Letter/Sound Rate of Mastery

RQ1 was analyzed using visual inspection and descriptive statistics. As previously defined in the methodology chapter, the school's internally developed phonological assessment served as a baseline measurement tool for both typically developing students and those identified as at-risk for a speech sound delay. This phonological assessment tool probed students to identify letter names and the corresponding letter sound.

Table 1 illustrates the number of weeks each participant took to master each letter/sound relationship throughout the study. The pre-assessment data is considered week one, and the post-assessment data is week eight. Table 1 summarizes how many weeks it took for each participant to state the letter name and letter sound during the weekly probes. If a participant did not master the sound within the study's duration, they were given a "0" to represent it was not mastered in any number of weeks. Each student's mean/rate was calculated based on the number of weeks it took to master each letter, and how many letters were mastered.

Table 1. *Rate of Letter/sound Relationships Data*

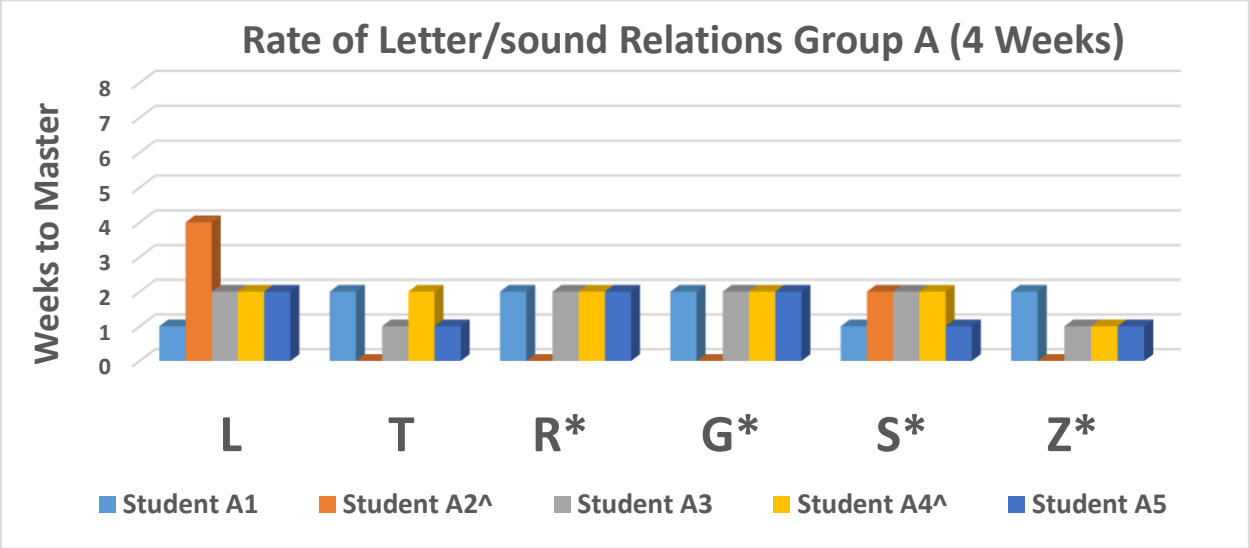
Student	L	T	R	G	S	Z	Sounds Mastered	Mean
A1	1	2	2	2	1	2	6/6	1.67
A2^	4	0	0	0	2	0	2/6	3.00*
A3	2	1	2	2	2	1	6/6	1.67
A4^	2	2	2	2	2	1	6/6	1.83
A5	2	1	2	2	1	1	6/6	1.50
B1	2	1	2	2	2	2	6/6	1.83
B2	2	1	1	2	1	1	6/6	1.33
B3^	8	0	0	0	3	2	3/6	4.33*
B4	2	0	0	0	2	2	3/6	2.00*
B5	0	2	0	0	2	2	3/6	2.00*

Note. ^ Indicates the participants identified as at-risk for SSD. * Indicates the students mean was calculated using the limited number of weeks a child mastered letter/sounds (i.e., not all sounds were mastered for each child, n<6).

All students in Group A received general phonics all six weeks of the study while receiving supplemental STS/VP for four of the weeks. The first two weeks is when the participants were only exposed to the general phonics curriculum.

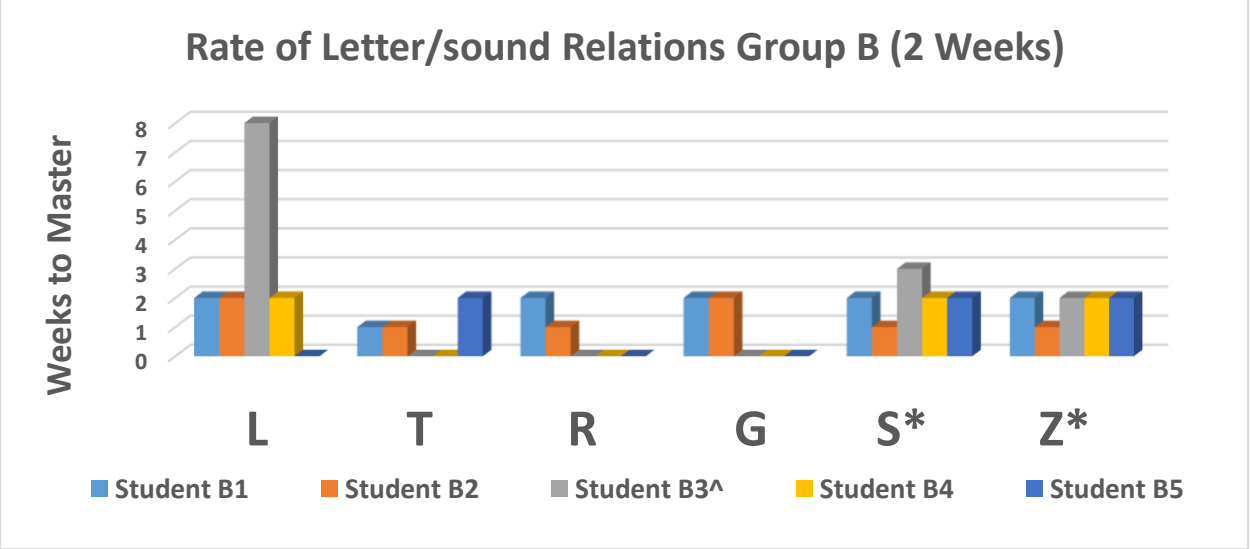
Most students in Group A mastered their sounds in a range of one to four weeks, with a mode of two weeks to master a letter/sound. In regard to the first research question, all six letter sound relationships (i.e., /l/ /t/ /r/ /g/ /s/ /z/) were mastered by four out of five participants who received four weeks of STS/VP mastery within two weeks (See Figure 2). The longest amount of time it took a participant to reach mastery level was four weeks (i.e., Student A2^, letter /l/). The students in Group B mastered the sounds in a range of one to eight weeks, with a mode of two weeks to master a letter/sound. All six letter sound relationships were mastered by only two out of the five participants who received two weeks of STS/VP (See Figure 3). The only two letter/sound pairs mastered by all five participants in Group B were the letters /s, z/ which were instructed with supplemental STS/VP.

Figure 2. *Rate of Letter/sound Relationships Group A (4 weeks)*



Note. * Indicates the letter/sound pairs targeted using general phonics *and* Visual Phonics.
^ Indicates participant identified at-risk for SSD

Figure 3. *Rate of Letter/sound Relations Group B (2 weeks)*



Note. * Indicates the letter/sound pairs targeted using general phonics *and* Visual Phonics.
^ Indicates participant identified at-risk for SSD

Both Figure 2 and Figure 3 depict the number of weeks it took for each participant to master the letter/sound relationships of the six determined phonemes. (Week 1 is considered pre-test, week 2 is the first week of intervention…, and week 8 is the post assessment). If a participant never mastered a letter/sound relationship, they were given a "0".

Rate of Mastery for Specific Sounds

During the initial two weeks when only general phonics was instructed, there was greater variability in participant understanding of letter/sound relations. Seven out of ten students were able to master the letter/sound /l/ or /t/ after the first week of instruction, while at least three students took several weeks. Three out of five students in Group A were able to achieve mastery of the letters /l, t/ in one week given general phonics instruction. Some participants had greater variation in their results, specifically, A2^ took five weeks to master /l/. Comparing the first two weeks to the last four weeks of STS/VP, the data illustrates that all five participants had steadier rates of mastery. Participants A1, A3, and A4 were able to master letters /r, g, s/ within one week when given general phonics with the supplemental STS/VP. Three out of five participants in group A were able to achieve letter/sound mastery for the letters /r, g, s, z/ within one week when given supplementary STS/VP.

Visually inspecting the data, more students in group A achieved mastery for /r/ and /g/ (i.e., four out of five participants) when STS/VP was implemented. In group B, only two of five participants achieved mastery without STS/VP implemented (See Figure 2 and Figure 3). Based on the first two weeks of the study when only general phonics was instructed, the letter/sound relationship of /l/ and /t/ had greater fluctuation in results. The rate of mastery for participants who received two weeks of STS/VP was more varied (See Figure 3). In comparison, only three of six letter sound relationships (i.e., /l/ /s/ /z/) were mastered by four out of five participants who received two weeks of STS/VP.

The letters /s, z/ had the most stability in rate of mastery across both groups. Dissecting the results, four out of five of the students in Group B were able to achieve mastery for the letters /s, z/ in only one week when they were given the supplemental STS/VP. In comparison, only

two out of five students were able to achieve mastery for the letters /l, t, r, g/ in one week when given a general phonics curriculum.

At-risk Participants and Letter/Sound Mastery

Studying the two participants who were found to be at-risk for a SSD in Group A (four weeks STS/VP), their results were more diverse (See Table 1 and Figure 2). Student A2^ had inconsistent results throughout the entire study, which may have been due to other academic challenges. Student A4^ was also identified as at-risk for having a SSD although they were able to maintain a consistent rate of mastery. One interesting observation of participant A4^'s experience was A4^'s implementation of the hand cue when prompted with auditory memory, but also implementing the multi-kinesthetic modalities of STS/VP. However, children in both Groups A and B were observed to use hand cues with varying levels of consistency.

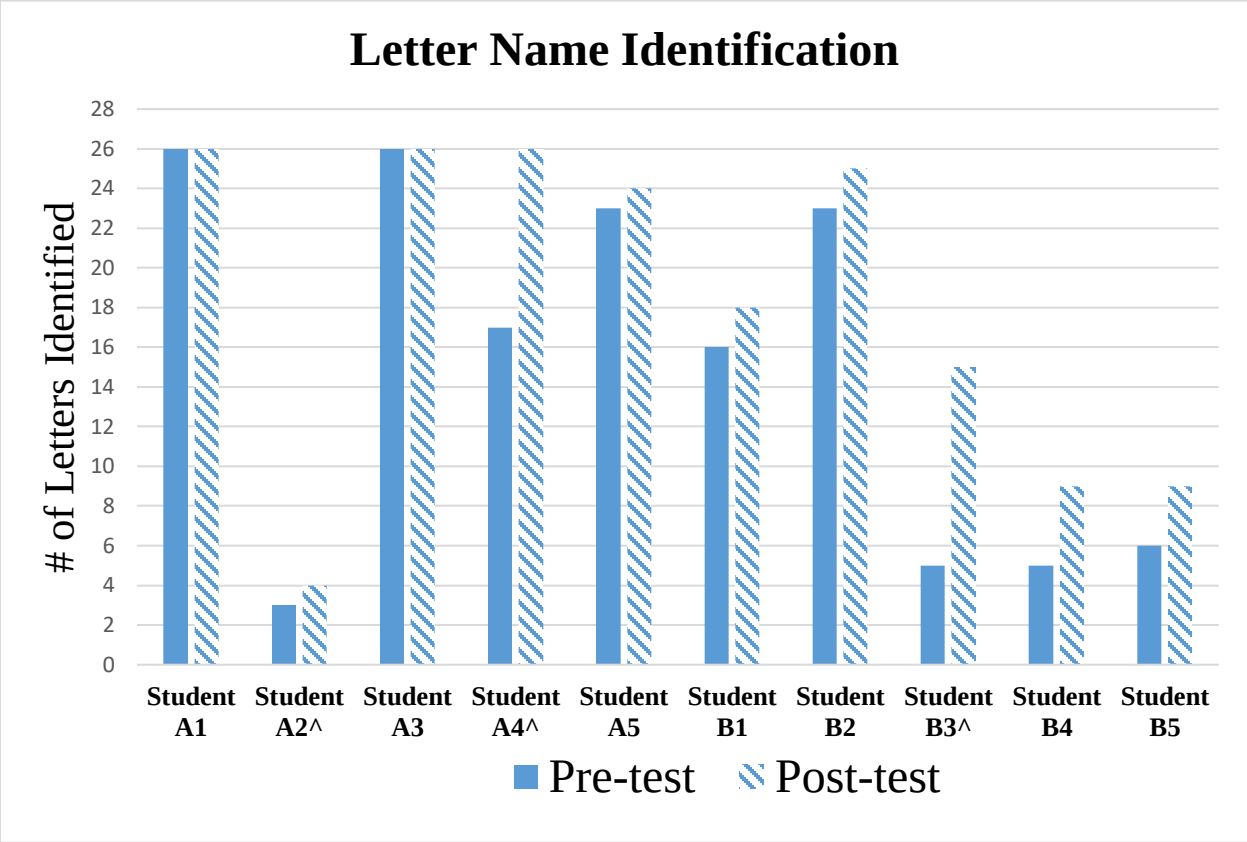
In Group B, only one participant was at-risk for a SSD (see Figure 3). Participant B3^ had changing results throughout the research study. During the first four weeks, participant B3^ did not master any letter/sound relations the first week of instruction given only general phonics. Interestingly, B3^ was able to master the relationship of /l/ by week eight of the study during the post-test assessment. However, participant B3^ was able to achieve mastery for the letter /s/ by week two and letter /z/ by week one. For B3^, it may be suggested that the multi-modality PA instruction provided some benefit to learning.

Other Findings Related to Letter Naming

An unexpected finding occurred when analyzing the results of the elementary school PA assessment. All students increased their ability to name letters in the English alphabet and/or letter/sound relationship in the post test assessment. Although this intervention focused on letters /l, t, g, r, s, z/, it is a positive finding that the participants experienced an expansion in

their overall letter-naming abilities *and* overall letter/sound knowledge on the post-test assessment. (See Figure 4 and Figure 5 for complete results).

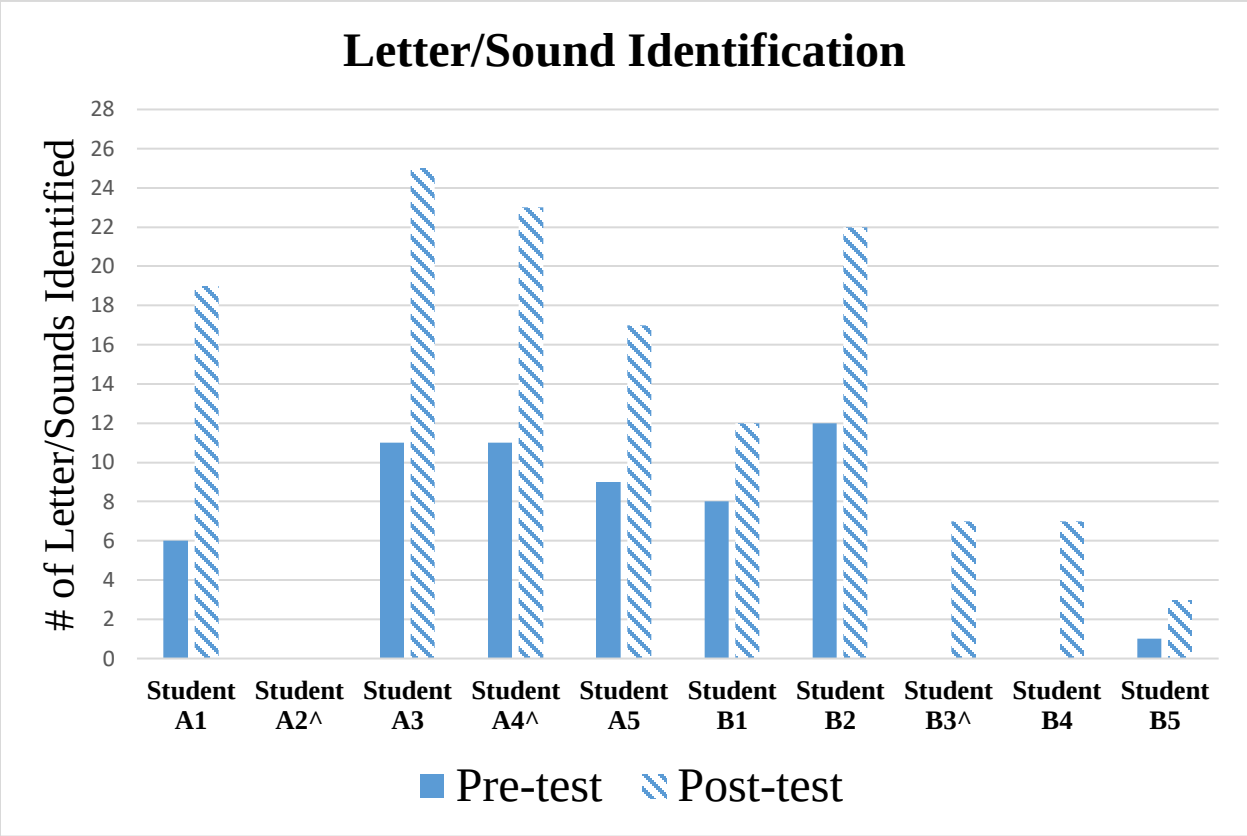
Figure 4. *Letter Name Identification Results*



Note. ^ Indicates participant identified at-risk for SSD

Figure 4 displays the results of the participants' ability to name all 26 letters of the English alphabet in the pre-test (week one) and post-test (week eight). There were only two students who could label all 26 letters in the baseline, participants A1 and A3. Participant A4^ was unable to name all 26 letters in the pre-test, but demonstrated the ability to name all letters in the post-test. All participants in the study demonstrated the ability to name an increased number of letters in the post-test in comparison to the start of the study.

Figure 5. *Letter/Sound Identification Results*



Note. ^ Indicates participant identified at-risk for SSD

In Figure 5, the results of the letter/sound portion of the PA assessment were graphed. This data reflects the participant's ability to state what sound the letter makes (e.g., /b/ says "buh"). Seven of the participants demonstrated the ability to identify more letter/sound relations post-test than in the pre-test. Most noticeably, participants B3^ and B4 were unable to state any letter/sound relationships at the start of the study, and each could produce seven letter/sounds during the post-test collections.

Speech Sound Production Mastery

The second research question (RQ2) asked, does sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a

Visual Phonics intervention? The data was separated per participant at-risk for a SSD to better understand the speech sound production accuracy from pre-test, intervention, and post-test. Mastery was set to 80% accuracy, or 5/6 words produced correctly during the baseline data, weekly probes, and post-test collection. Participants were administered six probes of each letter, with three in the initial placement of words and three in the final placement (e.g., **l**adybug/**l**emon/**le**go, bel**l**/bal**l**/wha**l**e). All participants demonstrated the ability to produce accurate initial and final speech sounds that were inaccurate in baseline with a varied degree of success. One participant mastered all six sounds, one mastered two of six sounds, and one mastered four of six sounds. See Figures 6, 7, and 8 for data regarding speech sound production mastery for the three participants identified as at-risk for SSD.

During baseline data collection, participant A2^ was found to appropriately produce the phonemes /t, g/ in the initial and final placements of words with at least 80% accuracy (See Figure 6). A2^ was unable to produce phonemes /l, r, s, z/ with at least 80% accuracy at the start of the study. Interestingly, A2^ was observed to master phonemes /l, t, r, g, s, / within one week of instruction. Based on the data in the chart, participant A2^ did not necessarily demonstrate increased mastery of speech sound productions from STS/VP, however, STS/VP may have made an impact during the post-assessment collection. Analyzing the post-test data, participant A2^ demonstrated mastery in all six phonemes assessed. This is an interesting finding considering they could not produce the /z/ phoneme during the intervention phase.

Figure 6. *Speech Sound Mastery Student A2^*

	Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Post-test
L	X	✓						✓
T	✓	✓						✓
R*	X	✓						✓
G*	✓	✓						✓
S*	X	✓						✓
Z*	X	X						✓

Note. * Indicates the letter/sound pairs targeted using general phonics *and* Visual Phonics. ^ Indicates participant identified at-risk for SSD. ✓Indicates mastered, X not mastered.

During baseline data collection, participant A4^ was able to appropriately produce only the phoneme /t/ in the initial, medial, and final placements of words with at least 80% accuracy when administered word probes. A4^ was unable to produce phonemes /l, r, g, s, z/ with at least 80% accuracy at the start of the study (See Figure 7). Student A4^ was exposed to STS/VP for the final four weeks of the study. Visually inspecting the data, student A4^ demonstrated the ability to master the phonemes /l, t, g, s, z/ given one week of instruction.

The phoneme /r/ was never mastered throughout the duration of the study, potentially due to complexity of the letter /r/ and that it is a later developing sound. However, the chart illustrates that participant A4 was able to master every other sound within one week. Student A4^ did not appear to be impacted whether the phonemic instruction was the general phonics or STS/VP. One important aspect of the results to consider is that participant A4^ was inconsistent with generalizing the ability to produce the targeted sounds during the post-assessment collection. A4^ demonstrated the ability to master only phonemes /t, g/ during the final data collection period.

Figure 7. *Speech Sound Mastery Student A4^*

	Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Post-test
L	X	✓						X
T	✓	✓						✓
R*	X	X	X	X	X			X
G*	X	✓						✓
S*	X	✓						X
Z*	X	✓						X

Note. * Indicates the letter/sound pairs targeted using general phonics *and* Visual Phonics. ^ Indicates participant identified at-risk for SSD. ✓Indicates mastered, X not mastered.

Participant B3^ was exposed to STS/VP for the final two weeks of the study. In the baseline data collection, B3^ was able to achieve mastery in producing the phonemes /s, z/ (See Figure 8). Throughout the study, participant B3^ demonstrated the ability to master the phonemes /t, g / within one week. Participant B3^ did not appear to demonstrate increased mastery of speech sound productions from STS/VP, however, is hard to interpret due to B3^ mastery the phonemes /s, z/ during baseline data. Evaluating the post-test data, student B3^ demonstrated mastery in four out of six phonemes assessed. Two of the phonemes continuously mastered in the post-assessment data included /s, z/, which were instructed using STS/VP.

Figure 8. *Speech Sound Mastery Student B3^*

	Baseline	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Post-test
L	X	X	X	X	X	X	X	X
T	X	✓						✓
R	X	X	X	X	X			X
G	X	✓						✓
S*	✓	✓						✓
Z*	✓	✓						✓

Note. * Indicates the letter/sound pairs targeted using general phonics *and* Visual Phonics. ^ Indicates participant identified at-risk for SSD. ✓Indicates mastered, X not mastered.

Summary of Results

The first research question aimed to determine if STS/VP facilitated mastery of PA skills at a different rate than general phonics. Rate of mastery was fairly consistent for the participants with four weeks of STS/VP intervention (Group A), with two weeks being the most frequent rate of mastery weeks across the six phonemes. The rate of mastery was less consistent for the participants with two weeks of STS/VP intervention (Group B). Two weeks was the rate of mastery for only three of six of the phonemes for these participants. The rate of mastery for three participants identified at-risk for SSD was more varied than those not at risk. Only one of the three participants at-risk mastered all six sounds, although all participants at risk mastered the final two sounds (i.e., /s/ and /z/) using the STS/VP intervention.

All participants were observed to benefit from both a general phonics curriculum *and* supplemental STS/VP as noted by gains in post-test phonological assessment probes. The second research question targeted speech sound production accuracy specifically for participants at-risk for a SSD when provided STS/VP. Speech sound production accuracy increased for all participants identified as at-risk in varied degrees, ranging from adding one speech sound (A4^) or two speech sounds (B3^) mastered in the post test assessment compared to baseline, to adding four speech sounds mastered (A2^) in the post test assessment. For this study's participants, it was promising to see acquisition of speech sound production abilities for all participants regardless of intervention group. In the final section, Chapter 5 will include a discussion on the study's results, interpretations, and future considerations.

Chapter V

Discussion

The purpose of this study was to investigate the effects of See the Sound/Visual Phonics on the phonological awareness skill of letter-sound relations and speech production. This chapter will discuss the possible interpretations of the findings of the study based on participant's results regarding their ability to master letter/sound relationships and speech sound productions. Two research questions guided this research: 1) Does a multi-kinesthetic Visual Phonics intervention facilitate the phonological awareness skill of letter-sound relations at a different rate, than a general phonics curriculum for preschool children who are identified as at risk for a speech sound delay? 2) Does speech sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a Visual Phonics intervention? This chapter will first review the study's findings in relation to previous research, then define limitations of the study, consider recommendations for future research, and provide final conclusions.

Summary of Findings in Relation to Current Literature

Studies related to phonological awareness.

The current study has many correlations and findings comparable to established research. In particular, the 2017 longitudinal study in Sweden conducted by Fälth, Gustafson and Svensson also studied the effect a phonological curriculum paired with an articulation supplement had on pre-reading skills in a preschool classroom. The phonological program was called Fonomix and is a multi-sensory method for teaching reading. The findings in the 2017 study showed all participants obtained higher scores with implementation of Fonomix at the end of the experiment than the comparison group with no Fonomix. Studies such as Fälth, Gustafson

and Svensson in 2017 indicate that PA curriculum targeting a preschool audience may be a profound age to instruct the many facets of PA.

Our research study had similar findings, in that both groups of participants demonstrated an increase in their ability to master letter/sound relations when exposed to a general phonics instruction and supplemental STS/VP. Specifically, four out of five participants in Group A had substantial improvements in their ability to name letter/sound relationships from pre-test to post-test measurements. In Group B, all five students had higher scores in the post-assessment when analyzing their ability to name letter/sound relationships. In summary, nine out of ten students demonstrated progress towards this specific PA skill when exposed to general phonics and a supplemental STS/VP while in a preschool setting.

Studies related to speech sound production and acquisition.

A study with similar findings was conducted by Gernand and Moran in 2007 and reflected the relationship between phonological deficits and PA abilities. Results of their study showed that the children with phonological errors performed significantly worse on tests of PA. This study echoes the finding that children with mild phonological problems, with no other language concerns, should be considered at-risk for a multitude of PA difficulties (Gernand & Moran, 2007). This directly correlates with the purpose and methods of the current study, which examined participants at-risk for a SSD and their ability to master PA skills (i.e., letter/sound relationship) as well as those found to be typically developing. An interesting discovery from the current study is the parallel to Fälth, Gustafson and Svensson's (2017) findings of the connection between at-risk students for SSD and PA skills. Our study has also found that incorporating a supplemental PA program into a SSD intervention was beneficial amongst other

potentially confounding variables (e.g., home instruction, time exposure to materials), to create an effective approach to learning and speech sound acquisition.

This researcher discovered interesting results when examining speech sound mastery for the three participants identified as at-risk for a SSD. The three participants had varying results, with participant A2^ mastering all six phonemes, participant A4^ mastering two phonemes, and participant B3^ mastering four phonemes. Variation in results may have been due to each participant's previous exposure to letters and letter/sound relationships in the home or structured educational setting. This study's findings connect with the conclusions in McLeod and Crowe's study in 2018, which reviewed various research studies on acquisition of speech sounds in various languages and emphasized the variability factors in individuals. McLeod and Crowe (2018) concluded that their findings supported the direct relationship between speech sound acquisition, production skills, and phonology in regards to the overall speech system. Therefore, if a child is having difficulties in one of the three categories, there is evidence that suggests they will have a delay or difficulty in another. The study aligns with this conclusion made by McLeod and Crowe (2018).

Studies related to See the Sound/Visual Phonics.

The study conducted in 2010 by Smith and Wang investigated the effect STS/VP can have on a child who is deaf and struggled with phonological awareness. Their data concluded that STS/VP along with a phonics-based curriculum significantly increased both speech sound production as well as PA skills. The current study's findings resembled the conclusions of Smith and Wang (2010). One significant limitation of Smith and Wang's (2010) study is that there is only one subject. To make their findings stronger, it would be beneficial to replicate their study with a quasi-experimental research design. In this way, the study would provide comparative

results across a larger number of participants. Although this study's research design has limitations (i.e., one participant), it does illustrate the impact STS/VP can have on a child's PA skills and speech sound production. The current study's methods and findings correlate with Smith and Wang (2010), in that all participants saw varying levels of success with the implementation of a phonics curriculum and supplemental STS/VP.

Differing from Smith and Wang (2010), Cihon, Gardner, Morrison and Paul in 2008 conducted a study with typically hearing kindergarteners who were at risk for literacy failure. See the Sound/Visual Phonics was implemented along with a general phonics curriculum. Gains were noted for all five participants who were instructed STS/VP and their reading risk level was decreased. Similar to the findings in this study, the current study also found that all participants made progress in their PA abilities. Additionally, in 2013, Gardner, Cihon, Morrison and Paul repeated a similar study and found that STS/VP can be an effective tool for instructing kindergarten students as a tier-2 intervention. A tier-2 intervention is a part of an instructional framework called response to intervention (RTI) and provides tiers of support to students who are not successful in core instruction provided to all students. Tier-2 intervention includes small group sizes and is low in intensity (Hall-Mills, 2019).

Gardner et al., (2013) concluded in both studies that STS/VP intervention is appropriate for children who are falling behind in a general phonics curriculum (Cihon et al., 2008; Gardner, et al., 2013). Although the present study did not focus on pre-reading skills, a common theme from these studies as well as the current study resounds that STS/VP has the potential to serve as a useful tool for children who struggle with various PA skills.

Limitations of Research

There were several limitations identified in the present study. First, the researcher had a small group of participants (i.e., one classroom of ten preschool students). For this reason, the study did not have a comparison or placebo group. Due to the small group size, there was also limited diversity in participants (i.e., culturally, racially, socioeconomically). Overall, Group A's data reflects that more students in that group may potentially have stronger academic or cognitive skills than participants in Group B. Although Group A received STS/VP for four weeks and Group B received STS/VP for two weeks, there could potentially be confounding variables (e.g., attention abilities, intrinsic motivation, exposure in the home setting).

Additionally, there was a restricted data collection timeline, which was due to the constraints of the academic schedule. One explanation for the variability of participant's scores in the letter/sound knowledge (See Figure 5) could be that there is a time effect as students understand the general curriculum of phonics. The more exposure they have to phonics instruction, the greater chance for generalization of knowledge of letter names (See Figure 4). It is possible that a longer intervention period may have found continued generalization of letter/sound knowledge to other phonemes that had not yet been instructed.

Recommendations for Future Research

Recommendations for future research include implementing STS/VP with typically hearing children who have difficulties with speech sound production. This population could potentially benefit from continued studies with this supplemental curriculum. While established research has shown the positive impact of STS/VP on PA skills, researchers would benefit to understand the effects STS/VP could have on the population of students who are at-risk for a SSD. Another future study could also research STS/VP as a tier-2 intervention for students who

are identified with PA difficulties, which would connect the research between the current study and previous studies (Gardner, Cihon, Morrison, & Paul, 2013; Goldstein, Schneider, McCarthy, & Kelley, 2017). Further, considering aspects such as number of participants, having comparative groups, and the duration of intervention would also be appropriate for future research.

It would be interesting to create a study that includes two classrooms of students both receiving general phonics instruction, with one classroom receiving STS/VP, and the other not. Conducting a study with a quasi-experimental research design could also be effective to study the outcomes of STS/VP program children with and without speech sound production difficulties. This could help SLP's further understand the impact STS/VP could have on PA skills and/or speech sound production abilities. Expanding the duration of the study for an entire academic school year would also allow the researcher to have more time to analyze data and inspect results. This could help further study the carryover or possible generalizing effects STS/VP has on a student over an extended period of time.

Final Conclusions and Researchers' Perspectives

In response to RQ1 "does a multi-kinesthetic Visual Phonics intervention facilitate the phonological awareness skill of letter-sound relations at a different rate, than a general phonics curriculum for preschool children who are identified as at-risk for a speech sound delay?", the data indicates both curriculums (general phonics and See the Sound/Visual Phonics) had positive impacts on the participants in this study. STS/VP has the potential to serve as a useful tool for all students in promoting effective education on phonological awareness skills, possibly due to its multi-modality approach. One observation that led to this conclusion was that the researcher saw all students implementing the hand cues associated with STS/VP either independently or

with a verbal cue from the researcher. This finding emphasizes the importance of the multi-modality aspect of STS/VP as it can appeal to a variety of learners, and aligns with previous literature that states the positive impact of hand cues with learning (Gardner, Cihon, Morrison, & Paul, 2013; Rusiewicz & Rivera, 2017; Schlesinger & Gray, 2017).

While STS/VP was not found to facilitate the mastery of letter/sound relationships at a faster or different rate than only general phonics, it did demonstrate consistency in mastering the letter/sound relationship for the study's participants. This conclusion can be interpreted that STS/VP could be a helpful instrument to support children's understanding and mastery of letter/sound relationships when used in conjunction with a general phonics curriculum. When reviewing the participants' who were considered at-risk for a SSD, there was not consistent evidence that showed STS/VP is the sole curriculum to aid them in mastering PA skills. However, all participants in the study did demonstrate growth of skills and understanding of PA knowledge, specifically when inspecting letter/sound knowledge.

During the final two weeks of the intervention phase, both groups received supplemental STS/VP instruction for the phonemes /s, z/. When the data from both Group A and Group B were combined, it was found that nine out of ten participants mastered /s, z/. Further, all ten students mastered /s/. This aspect of the data can be interpreted that STS/VP had no harm on students, and one could argue it provided support for phonological awareness as intended. These findings are helpful when considering the application of this knowledge to clinical opportunities. The findings of this study match previously established research and found that STS/VP can be a useful tool to use with a variety of learners; for a variety of phonological awareness difficulties (Woolsey, Satterfield, & Roberson, 2006).

In response to RQ2, "does sound production accuracy increase from baseline for children identified as potentially at-risk for a speech sound delay when using a Visual Phonics intervention?" All participants demonstrated the ability to produce accurate initial and final speech sounds that were inaccurate in baseline with varied degree of success. However, this question specifically emphasized the results from participants identified as at-risk for a SSD. Participant A2^ mastered all six sounds targeted in the study, participant A4^ mastered two out of six, and participant B3^ mastered four out of six. Findings of the study illustrate that STS/VP had a positive impact on each participants' speech sound production, which could be due to several variables. First, this could be due to the curriculum and multi-kinesthetic characteristics of STS/VP. Additionally, the participants' ability to correctly produce the targeted speech sounds may have been due to increased exposure to the sounds throughout the duration of the study and increased opportunities to practice and produce the phonemes during structured activities and lessons (i.e., general phonics instruction and STS/VP supplemental instruction).

Researcher perspectives at the conclusion of this study were that See the Sound/Visual Phonics seemed to work well for both typically developing students, as well as the participants who were at-risk for a speech sound disorder. It was promising to see both groups of participants making gains side by side through the use of this intervention. We have identified that STS/VP was flexible, adaptable, and beneficial to all participants in the study. Upon reflection, the following observations were noted from the researchers: subjectively, the participants were observed to be more engaged in the STS/VP lessons when instructed the hand cues for each letter. This could potentially be a future area to further study. Additionally, the participants demonstrated carryover of the hand cues into the general education teacher's general phonics instruction, and could also serve as a prospective quantitative study to specifically measure the

researchers' informal observations. Due to these observations, STS/VP was found to be easy to instruct, implement into a variety of lesson activities (e.g., matching picture cards, sorting letters, art activities), and a motivating way to engage the young participants who seemed to benefit from the multi-modality approach of STS/VP.

The researchers' perspectives and study's results suggest that STS/VP could be a good supplemental tool to use along with a general phonics curriculum to support speech sound production as well as phonological awareness skills. The findings were consistent with studies that were also supportive of visual phonics (Cihon, Gardner, Morrison, & Paul, 2008; Gardner, Cihon, Morrison, & Paul, 2013; Narr & Cawthon, 2011; Woolsey, Satterfield, & Roberson, 2006; Ye Wang et al., 2013; Smith & Ye Wang, 2010) In conclusion, the perspectives, ideas, and results gained from this study can help future research and clinical applications in determining potential benefits of implementing See the Sound/Visual Phonics with a preschool population of children who may have difficulties with sound production or letter/sound knowledge.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print*. Cambridge, Mass.: MIT Press.

ASHA. (2019a). *Phonological processing*. Retrieved from https://www.asha.org/Practice-Portal/Clinical-Topics/Written-Language-Disorders/Phonological-Processing/.

ASHA. (2019b). *Speech sound disorders- Articulation and phonology*. Retrieved from https://www.asha.org/Practice-Portal/Clinical-Topics/Written-Language-Disorders/Phonological-Processing/.

Byiers, B. J., Reichle, J., & Symons, F. J. (2012). Single-subject experimental design for evidence-based practice. *American Journal of Speech-Language Pathology*, *21*(4), 397-414. Retrieved from doi:10.1044/1058-0360(2012/11-0036)

Cihon, T. M., Gardner III, R., Morrison, D., & Paul, P. V. (2008). Using visual phonics as a strategic intervention to increase literacy behaviors for kindergarten participants at-risk for reading failure. *Journal of Early & Intensive Behavior Intervention*, *5*(3), 138–155. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1037/h0100428

Common Core Standards Initiative. (2019). English language arts standards: language kindergarten. Retrieved from http://www.corestandards.org/ELA-Literacy/L/K/

Dale, P. S., & Hayden, D. A. (2013). Treating speech subsystems in childhood apraxia of speech with tactual input: The PROMPT approach. *American Journal of Speech-Language Pathology*, *22*(4), 644–661. Retrieved from https://doi.org/10.1044/1058-0360(2013/12-0055)

Fälth, L., Gustafson, S., & Svensson, I. (2017). Phonological awareness training with articulation promotes early reading development. *Education*, *137*(3), 261–276. Retrieved from

https://login.trmproxy.mnpals.net/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=121449191&site=ehost-live

Farquharson, K. (2019). It might not be “Just Artic”: The case for the single sound error. *Perspectives of the ASHA Special Interest Groups*, *4*(1), 76-84. Retrieved from doi:10.1044/2018_pers-sig1-2018-0019

Farquharson, K., & Boldini, L. (2018). Variability in interpreting “Educational Performance” for children with speech sound disorders. *Language, Speech & Hearing Services in Schools*, *49*(4), 938–949. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1044/2018pass:[_]LSHSS-17-0159

Gardner, R., Cihon, T. M., Morrison, D., & Paul, P. (2013). Implementing visual phonics with hearing kindergarteners at risk for reading failure. *Preventing School Failure*, *57*(1), 3042. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1080/1045988X.2011.654365

Gernand K. L., & Moran M. J. (2007). Phonological awareness abilities of 6-year-old children with mild to moderate phonological impairments. *Communication Disorders Quarterly*, *28*(4), 206–215. Retrieved from http://search.ebscohost.com.trmproxy.mnpals.net/login.aspx?direct=true&db=rzh&AN=105743741&site=ehost-live

Gilbert, D. W., & Swiney, K. A. (2007). *Sound strategies for sound production: A multisensory approach for improving intelligibility: Clinicians manual*. Austin, TX: Pro-Ed.

Goldstein, H., Olszewski, A., Haring, C., Greenwood, C. R., Mccune, L., Carta, J., . . . Kelley, E. S. (2017). Efficacy of a supplemental phonemic awareness curriculum to instruct preschoolers with delays in early literacy development. *Journal of Speech, Language, and Hearing Research*, *60*(1), 89-103. Retrieved from doi:10.1044/2016_jslhr-l-15-0451

Hall-Mills, S. (2019). A comparison of the prevalence rates of language impairment before and after response-to-intervention implementation. *Language, Speech & Hearing Services in Schools*, *50*(4), 703–709. https://doi-org.trmproxy.mnpals.net/10.1044/2019_LSHSS-18-0144

Johnson, K. L., & Roseman, B. A. (2003). *The source for phonological awareness*. East Moline, IL: LinguiSystems, Inc.

Kart, A. (2017). *The qualitative meta-analysis of visual phonics: A promising strategy to teach reading.* [Unpublished thesis dissertation]. Retrieved from https://etd.ohiolink.edu/

Kinzer Courter, M. (2019). Childhood apraxia of speech: Evaluation and practical treatment strategies [PowerPoint slides]. Retrieved from http://www.courtercommunications.com/Visual_Graphics.html

McLeod, S., Harrison, L. J., McAllister, L., & McCormack, J. (2013). Speech sound disorders in a community study of preschool children. *American Journal of Speech-Language Pathology*, *22*(3), 503–522. Retrieved from https://doi.org/10.1044/1058-0360(2012/11-0123)

McLeod, S., & Crowe, K. (2018). Children's consonant acquisition in 27 languages: A cross-linguistic review. *American Journal of Speech-Language Pathology*, *27*(4), 1546-1571. Retrieved from http://doi.org/101044/2018_AJSLP-17-0100

Montgomery, J. (2008). Dave Krupke: What exactly is visual phonics? *Communication Disorders Quarterly*, *29*(3), 177–182. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1177/1525740108318413

Narr, R. F., & Cawthon, S. W. (2011). The "Wh" questions of visual phonics: What, who, where, when, and why. *Journal of Deaf Studies & Deaf Education*, *16*(1), 66–78. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1093/deafed/enq038

National Reading Panel (US) National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel: Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00–4769). Washington, DC: Government Printing Office.

Preston, J., & Louise Edwards, M. (2010). Phonological awareness and types of sound errors in preschoolers with speech sound disorders. *Journal of Speech, Language & Hearing Research*, *53*(1), 44–60. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1044/1092-4388(2009/09-0021)

Preston, J. L., Hull, M., & Edwards, M. L. (2013). Preschool speech error patterns predict articulation and phonological awareness outcomes in children with histories of speech sound disorders. *American Journal of Speech-Language Pathology*, *22*(2), 173–184. Retrieved from https://doi.org/10.1044/1058-0360(2012/12-0022)

Pullen, P. C., & Justice, L. M. (2003). Enhancing phonological awareness, print awareness, and oral language skills in preschool children. *Intervention in School and Clinic. 39*, 87-89.

Rusiewicz, H. L., & Rivera, J. L. (2017). The effect of hand gesture cues within the treatment of /r/ for a college-aged adult with persisting childhood apraxia of speech. *American Journal of Speech-Language Pathology*, *26*(4), 1236–1243. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1044/2017_AJSLP-15-0172

Schlesinger, N., Gray, S. (2017). The impact of multisensory instruction on learning letter names and sounds, word reading, and spelling. *Annals of Dyslexia*, *67*(3), 219–258. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1007/s11881-017-0140-z

Secord, W. A. (2007). *Eliciting sounds: Techniques and strategies for clinicians*. Clifton Park, NY: Thomson Delmar Learning.

Smith, A., & Ye Wang. (2010). The impact of visual phonics on the phonological awareness and speech production of a student who is deaf: A case study. *American Annals of the Deaf, 155*(2), 124–130. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1353/aad.2010.0000

Wambaugh, J., & Schlosser, R. (2014). Single-subject experimental design: An overview. Retrieved from https://academy.pubs.asha.org/2014/12/single-subject-experimental-design-an-overview/

West, J., Denton, K., & Reaney, L.M. (2001). *The kindergarten year findings from the early childhood longitudinal study, kindergarten class of 1998–99*. Washington DC: National Center for Educational Statistics (NCES). Retrieved from http://nces.ed.gov/pubs2001/2001023.pdf

Woolsey, M. L., Satterfield, S. T., & Roberson, L. (2006). Visual phonics: An english code buster? *American Annals of the Deaf, 151*(4), 452–457. Retrieved from https://doi-org.trmproxy.mnpals.net/10.1353/aad.2006.0049

Ye Wang, Spychala, H., Harris, R. S., & Oetting, T. L. (2013). The effectiveness of a phonics-based early intervention for deaf and hard of hearing preschool children and its possible impact on reading skills in elementary school: A case study. *American Annals of the Deaf, 158*(2), 107–120 Retrieved from. https://doi.org/10.1353/aad.2013.0021

https://academy.pubs.asha.org/2014/12/single-subject-experimental-design-an-overview/

Appendix A

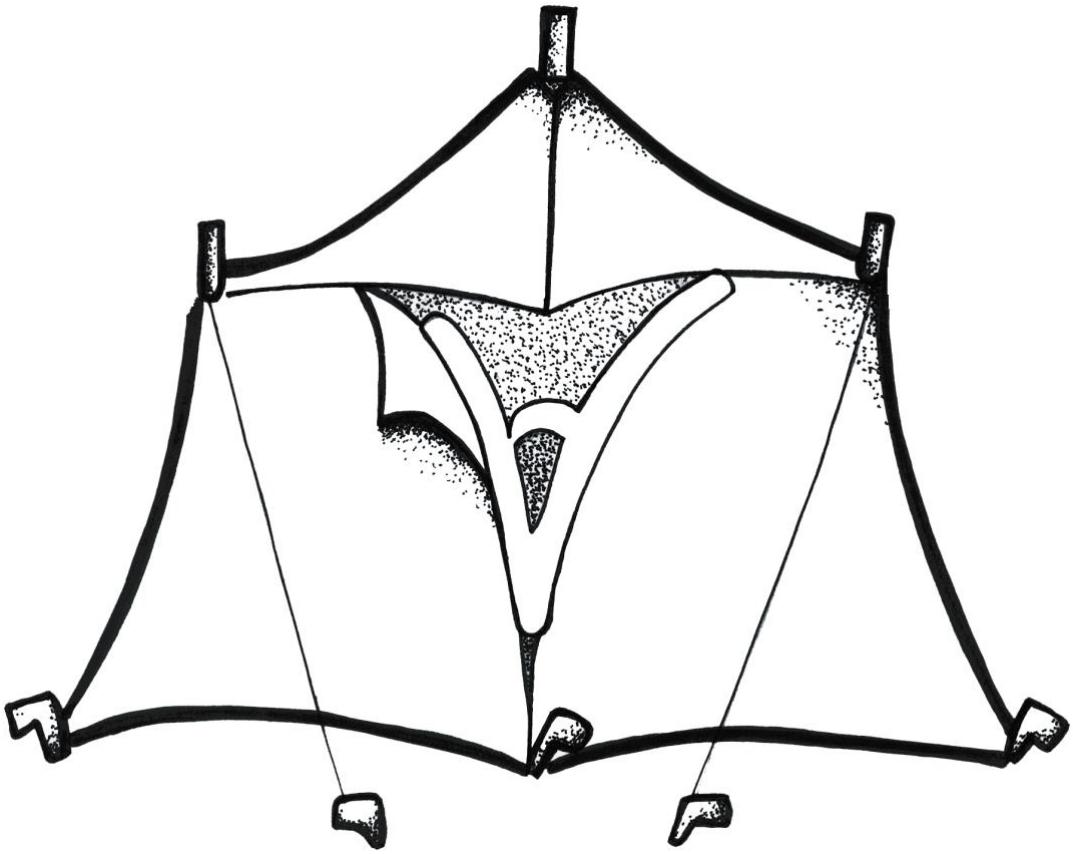
See the Sound/Visual Phonics Hand Cue Card for Letter /t/

tent

/t/ e n t

T t

t t



Appendix B

Informed Consent

Please read this consent agreement carefully before agreeing to participate in this study.

Title of Study: The Effectiveness of Visual Phonics to Promote Phonological Awareness in Preschool Children With and Without Speech Sound Delays

Purpose of the study: We hope to learn if Visual Phonics is an effective tool to instruct individuals who are typically developing as well as those with speech sound errors, to facilitate their phonological awareness skills.

Study Description: This study examines the phonological awareness skills of preschoolers. Phonological awareness is the knowledge of sound structures in a language and manipulating them. The researcher will be using the established school phonological awareness assessment to collect baseline data. All students in the classroom will be given a hearing screening as well as a speech sound screener. Students will be identified as passing the speech sound screener, or identified as at-risk for a speech sound delay, noting particular sound errors. If any students fail the hearing screening, a complete hearing evaluation will be recommended.

All students will be included in the intervention, and students with completed permission slips will have data included in the study. Data will be collected only on students who pass the hearing screening. During the first two weeks, all students will be instructed the current phonics curriculum by their general education teacher focusing on one letter/sound pair weekly. The general phonics curriculum does not use hand-cues. For the remaining four weeks, the researcher will divide the classroom into two small groups. In a pull-out method, the researcher will provide See the Sound/Visual Phonics intervention. This is a phonics curriculum that includes hand-cues, written symbols, visuals, and verbal cues to teach letter/sound pairs. All groups will receive the Visual Phonics intervention; however, the start date will stagger to provide comparison. The researcher will assess the students' post-intervention by administering the school phonological awareness assessment as well as the speech sound screener.

Time required: The study will last for a duration of 6-10 weeks at the beginning of the school year, 2x/week for 30 minute sessions. All participants will not be subjected to additional time taken away from educational material. The researchers will be implementing the Visual Phonics curriculum during the designated phonics curriculum time slot.

Risks: There are no identified risks of the study. All preschool students at XXXX will eventually receive the Visual Phonics intervention. The study simply allows the researcher to review the immediate benefits of the program.

Benefits: The participants of the study will benefit from the phonics curriculum as well as the Visual Phonics curriculum.

Confidentiality: All information about the subjects is completely anonymous in the study's findings.

Participation and withdrawal: If at any time you need to withdraw from the study, there will be no penalty.

Contact: This study is conducted by Katelyn Derby, B.A. and Dr. Elaine Pyle, Ph.D., MS/CCC-SLP. Katelyn Derby is a graduate clinician in the Speech Language Pathology Master's program at Minnesota State University Moorhead and can be reached at derbyka@mnstate.edu. Dr. Elaine Pyle is an Associate Professor in the Speech Language and Hearing Sciences department at MSUM and can be reached at pyleel@mnstate.edu.

Whom to contact about your rights in this experiment: Katelyn Derby, derbyka@mnstate.edu Speech Language Pathology department, or else you may contact Dr. Lisa I. Karch, Chair of MSUM Institutional Research Board, at irb@mnstate.edu, or 218-477-2699.

Agreement:

The purpose and nature of this research have been sufficiently explained and I agree to participate in this study. I understand that I am free to withdraw at any time and my withdrawal will not affect any future relationship with XXXX.

In signing this agreement, I also affirm that I am at least 18 years of age or older.

Signature: _____ Date: _____

Name (print): _____

Appendix C

Adapted Lesson Plan for STS/VP Instruction

STEPS	TEACHER BEHAVIOR	PARTICIPANT BEHAVIOR
1	"Watch my mouth while I say /l/" and says /l/ in an exaggerated method Teacher repeats the step twice	Watch and listen
2	Teacher says "Now you try with me" Teacher says the /l/ sound Repeats twice	Participant says the /l/ sound Repeats twice
3	Teacher says "I'm going to show you a hand sign that looks and feels like /l/" Teacher demonstrates the hand sign while saying /l/ Teacher repeats the step twice	Watch and listen
4	Teacher says "Now you try it with me" Teacher says /l/ sound while making the hand sign Repeats twice	Participant says the /l/ sound while making the hand sign Repeats twice
5	Teacher says "Show me the /l/ sound and the hand sign four times"	Participant says the /l/ sound and makes the corresponding hand sign Participant repeats three other times
6	Teacher presents a field of at least three letters and asks the participant to "point to the letters that make the sound /l while making the corresponding hand sign"	Points to corresponding letter
6	Teacher presents the participant with five words that contain the target sound	Participant reads the words, making the corresponding hand sign each time he/she comes to the target sound
7	Teacher says "To remember what letters make the sound /l/, I can draw a picture of	Watch and listen

	the hand sign and write it under the letters to help practice the words. This is what the secret code for /l/ looks like" The teacher draws the code no more than ten variant spellings and says "the /l/ sound starts with the tongue on the back of my top teeth, the hand signal (LOOK THIS UP) The code looks like what the hand does	
8	Teacher gives the participant a sentence with 5 words containing the target sound embedded	Participant and teacher read the sentence together while making the corresponding hand sign each time he/she comes to the target sound

(Adapted from: Cihon, Gardner, Morrison, & Paul, 2008)